GEOTECHNICAL REPORT

KAISER FOOTHILL RANCH MEDICAL OFFICE BUILDING

LAKE FOREST, CALIFORNIA

GEOBASE

SOIL/ROCK MECHANICS AND FOUNDATION ENGINEERING

GEOTECHNICAL REPORT

Kaiser Foothill Ranch Medical Office Building
Lake Forest, California

Prepared for:

Kaiser Foundation Health Plan, Inc.
Placentia, California

By:

GEOBASE, INC.
23362 Peralta Drive, Unit 4
Laguna Hills, California 92653
(949) 588-3744

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LIST OF APPENDICES

TABLE OF CONTENTS

TABLE OF CONTENTS continued...

Page

LIST OF TABLES

LIST OF APPENDICES continued...

APPENDIX C

GEOBASE, March 2003

GEOBASE, May 2011

APPENDIX D

I. INTRODUCTION

Kaiser Foundation Health Plan, Inc. is planning the construction of the Foothill Ranch MOB (MOB), located at the southwest corner of Lake Forest Drive and Towne Center Drive, in the City of Lake Forest, California. The site location is shown on the Location Map, Figure A-1, Appendix A.

In March 2003, GEOBASE completed a geotechnical investigation for the proposed MOB. The results of this investigation were presented in a report titled "Geotechnical Investigation, Lake Forest Medical Office Building, Kaiser Foundation Health Plan, Inc., Lake Forest, California", prepared by GEOBASE, INC. (GEOBASE 2003) for Kaiser Foundation Health Plan, Inc., Placentia, California, dated March 2003. Since the completion of the aforementioned report:

- The location and size of the proposed MOB was revised; and,
- Additional bucket auger borings were advanced to verify the depth to bedrock along the south side of the structure and to evaluate the foundation recommendations.

In addition, seismic design criteria adopted in the GEOBASE, March 2003 report were based on 1997UBC/ 2001 CBC. On January 01, 2011, the 2010 CBC became effective. Therefore, GEOBASE was authorized by Kaiser Foundation Health Plan, Inc. to revise and up-date the GEOBASE March 2003 report to incorporate: the revised location and size of the proposed MOB; results of the additional bucket auger borings data; results of percolation tests; and, to comply with all requirements outlined in the 2010 CBC, including the seismic design criteria. As ***a result, this report replaces and supersedes the GEOBASE, March 2003 report***.

For this geotechnical investigation, we were provided with:

- Plan showing the percolation test locations;
- Plan of the proposed MOB; and,
- Layout, in the field, of the proposed building by a licensed surveyor.

II. REVIEW OF AVAILABLE REPORTS

2.1 Buildable Building Pad Reports

The following reports used for construction of the buildable building pad were provided:

- Geotechnical Investigation and Grading Plan Review, Planning Area 8, A Portion of Tentative Tract 13419, Foothill Ranch, County of Orange, California; Report by Pacific Soils Engineering, Inc., dated December

15, 1994 (W.O. 500312).

- Response to OCEMA Review Sheet, dated January 9, 1995, Addressing the above report; Report by Pacific Soils Engineering, Inc., dated January 17, 1995 (W.O. 500312).

- Report of Findings, Planning Area 8, A Portion of Tentative Tract 13419, Foothill Ranch, County of Orange, California; Report by Pacific Soils Engineering, Inc., dated February 13, 1996 (W.O. 500353).

- Response to Letter From Transportation Corridor Agencies, Regarding Planning Area 8, dated March 22, 1996; Report by Pacific Soils Engineering, Inc., dated April 15, 12996 (W.O. 500353).

- Project Grading Report, Lots 105 Through 108 and the Adjacent Portion of Towne Centre Drive, Planning Area 8, A Portion of Tentative Tract 13419, Foothill Ranch, County of Orange, California; reported by Pacific Soils Engineering, Inc. dated November 6, 1998 (W.O. 500312-G0.

2.2 Summary of Review

A review of the reports listed in subsection 2.1 indicates the following:

- In December 1994, a site investigation and grading plan review was performed by Pacific Soils Engineering, Inc. for the project site – Lots 105 and 106 (Pacific Soils Engineering, Inc. December 1994). Based on the findings of the report, removal of up to twenty (20) feet of highly compressible and potential collapsible soils are anticipated at the site.

- The main portion of the rough grading for the project site (Lots 105 and 106) was performed between September 1995 and December 1995. Additional rough grading for the cut graded portions and reconditioning of the compacted fill surface was not completed until October 1998. During the rough grading operations, dry, loose and compressible alluvium/colluvium was removed to the underlying bedrock where possible, or saturated alluvium.

  Based on the elevations of the compaction test results and "elevations of toe of removal backcut" shown on Drawing Sheet A of Project Grading Report (Pacific Soils November 1998), the depths of removals reached up to a maximum of approximately sixty three (63) feet below existing ground surface i.e. maximum depth of engineered fills is approximately sixty three (63) feet below (current) existing ground surface in the southern portion of Lot 105.

  The removals below previously placed fills for Lake Forest Drive and the Foothill Transportation Corridor was initiated at the toe of the graded slopes. The removal backcut ratio was 1H:1V (Horizontal:Vertical) and was continued downward to either bedrock or saturated alluvium. Partially saturated alluvium (potentially collapsible soils) was observed in the backcut below the previously placed fills and was left in-place.

- In November 1995, five (5) borings (SB-4 through SB-8) were drilled adjacent to the Foothill Transportation Corridor, Lake Forest Drive and Bake Parkway to evaluate and define the hydro-consolidation (or collapse) potential of the partially saturated alluvium that was left in-place during the construction of Lake Forest Drive, Portola Parkway and the Foothill Transportation Corridor (Pacific Soils February 1996). Two (2) of borings (SB-4 and SB-8) were located along the southern and eastern boundaries of Lot 105. Based on the results of the collapse potential tests it was concluded that wetting of the left in-place partially saturated alluvium will result in settlement. Within Lot 105, differential settlement was estimated to vary from 0.5 inch in fifty (50) feet near boring SB-8 adjacent to Lake Forest Drive to two and one-half (2.5) inch in fifty (50) feet near SB-4 adjacent to Foothill Transportation Corridor.

  As a result, a "Restricted Use Area" was recommended along the southern and eastern boundaries of the project site (Lots 105 and 106). The restricted use zones are considered suitable for use as parking areas, driveways and landscaping. Structural improvement to be built within the limits of the restricted use zones should be designed to withstand differential settlement up to 0.5 inch in fifty (50) feet near boring SB-8 and 2.5 inches in fifty (50) feet near boring SB-4. The location of the "Restricted Use Area" are shown on Drawing Sheet 4 of the Project Grading Report (Pacific Soils November 1998) and is reproduced herein as Figure A-3, Appendix A, Restricted Use Area.

- Based on the settlement monuments monitoring results, the granular nature of the on-site soils and the length of time the fill mass has been in place (since 1996), it was the opinion of Pacific Soils Engineering, Inc. that primary settlement of the fill mass is complete and construction can safely proceed (Pacific Soils November 1998).

III. SITE AND PROJECT DESCRIPTIONS

3.1 Site Description

The roughly rectangular-shaped site is bounded by the Towne Centre Drive to the north, a slope and Lake Forest Drive to the east, a slope and the on-ramp to Foothill Transportation Corridor to the south, and one (1) storey office buildings to the west. The site is currently undeveloped and unpaved. Based on Preliminary Grading Plan (Pacific Soils, November 6, 1998), the site is relatively flat with elevations ranging from 778 at the southwestern portion to 770 at the northeastern portion of the site. Surface drainage appears to be good.

A sump pit was observed at the northeastern corner of the site. Minor erosion gullies and a small pond of standing water of approximately three (3) to five (5) inches deep were observed at the time of the 2003 field investigation near the catch basin.

The existing slopes adjacent to Lake Forest Drive and the on-ramp to Foothill Transportation Corridor are covered with landscape grasses and small trees. These slopes vary from six (6) to twenty five (25) feet in height and have an approximate slope ratio of 2H:1V (Horizontal: Vertical). An erosion gully of up to approximately ten (10) to

twelve (12) feet wide and three (3) to five (5) feet deep was observed on the slope surface at the junction of Lake Forest Drive and the on-ramps to the Foothill Transportation Corridor. At the time of the additional borings (May 2011), this gully was vegetated with small trees and bushes.

Existing utilities consisting of a sump pit and underground storm drain, and overhead cables were noted at the northeastern corner of the site and along the southern site boundary, respectively.

3.2 Proposed Construction

The proposed construction will consist of a one (1) storey slab-on-grade MOB and surface parking. The layout of the proposed MOB is shown on the Site and Boring Locations Plan, Figure A-2, Appendix A.

It is understood that the preliminary dead-plus-live interior column loads are less than 50 kips, respectively. It is also understood that the exterior walls dead-plus-live loads may be assumed to be 2 kips per linear foot of foundation.

IV. SITE INVESTIGATION

4.1 Field Program

The initial field investigation was carried out on February 19 and 20, 2003, and consisted of advancing five (5) borings and seven (7) Cone Penetration Tests (CPT) at the site, at the approximate locations shown on the Site and Boring Locations Plan, Figure A-2, Appendix A. On May 20, 2011, three (3) bucket auger borings were advanced. The borings and CPT's were located in the field, utilizing cloth tape and elevations were estimated from the Preliminary Grading Plan. The bucket auger borings were located approximately five (5) feet outside of the building limits established in the field by a surveyor. Therefore, the boring and CPT's locations and elevations should be considered accurate only to the degree implied by the methods used.

The borings were advanced to a maximum depth of sixty-nine and one-half (69.5) feet using a truck-mounted CME-75 drill rig, fitted with hollow stem augers. The bucket auger borings were advanced to a maximum depth of fifty-four (54) feet. The Log of Borings, together with an Explanation of Terms and Symbols used, are given in Appendix B, Figures B-1 thru B-6 and B-16 thru B-18, inclusive. The CPT's data are also presented in Appendix B. In addition, the Log of Borings SB-4 and SB-8 from the previous investigation (Pacific Soils, February 1996) are included in Appendix B. The location of these borings is shown on Figure A-3, Restricted Use Area, Appendix A.

Cone Penetration Tests (CPT) were performed in accordance with ASTM D 3441 by Gregg In Situ, Inc. to supplement the subsoils data obtained at the boring locations. The CPT equipment consists of a cone assembly mounted at the end of a series of hollow sounding rods. A set of hydraulic rams is used to push the cone and rods

into the soil, and a continuous record of cone and friction resistance versus depth is obtained in digital form at the ground surface. A specially designed truck is used to transport and house the test equipment and to provide a ten (10) ton reaction to the thrust of the hydraulic rams. The CPT records provide a relatively accurate definition of the thickness of various soil layers and provide continuous subsoil data for static settlement, liquefaction and seismic settlement analyses.

Field testing, at the boring locations, consisted of the Standard Penetration Test (SPT). The SPT (ASTM D 1586) test involves failure of the soil around the tip of a split spoon sampler for a condition of constant energy transmittal. The split spoon, two (2) inches outside diameter and one and three-eights (1-3/8) inches inside diameter, is driven eighteen (18) inches and the number of blows required to drive the sampler the last foot is recorded as the "N" value, or SPT blow count. The driving energy is provided by a 140-pound weight dropping thirty (30) inches.

Three (3) percolation tests were also performed at the site at the locations shown on Figure 1 of the percolation tests report, Appendix D.

Sampling consisted of:

- Collection of disturbed samples at selected locations retrieved from the auger;
- Collection of samples retrieved from the Standard Penetration Test (SPT) split spoon; and,
- Collection of soil samples at selected locations using a California Modified Sampler. The soil samples were retained in a series of brass rings, each having an inside diameter of 2.41 inches and a height of one (1) inch. These ring samples were placed in close- fitting, moisture-tight containers for shipment to the laboratory.

4.2 Laboratory Testing

The samples obtained during the field program were returned to the laboratory for visual examination and testing. The soils were classified in accordance with ASTM D 2487 and D 2488. The laboratory testing program consisted of the following:

- Laboratory determination of water (moisture) content of soils, rock, and soil-aggregate mixtures (ASTM D 2216) and dry density;
- Particle size of analysis of soils (ASTM D 422);
- Direct shear test of soils (ASTM D 3080);
- Consolidation tests (ASTM D 2435);

- Resistance R-value of subgrade soils (CAL. 317A);
- Expansion potential of soils (ASTM D 4829); and,
- Water soluble sulfates content of soils (CAL 417A), pH, electrical resistivity and water soluble chlorides.

The laboratory test results are presented on the Log of Borings, Figures B-2 thru B-6 and B-16 thru B-18, inclusive, Appendix B, where applicable, and in Appendix C.

V. SUBSURFACE CONDITION

5.1 Subsoil Conditions

The generalized stratigraphic profile at the boring locations consists two (2) to forty-five (45) feet of fill soils (silty sands to clayey sands) overlying sandstone bedrock. Cross-sections A-A' and B-B', showing the inferred subsoils profile, are provided as Figures A-4 and A-5, respectively, Appendix A. The thickness of fills encountered at the boring and CPT locations are summarized in Table I.

TABLE I

THICKNESS OF FILLS AT BORING AND CPT LOCATIONS

Boring/CPT Number	Existing Ground Surface Elevation* (ft.)	Thickness of Fill (ft.)/ Elevation (ft.)
B-1	774	2.0/772
B-2	774	11.0/763
B-3	775	5.0/770
B-4	775	2.0/773
B-5	775	28.0/747
CPT-1	775	140/761
CPT-2	774	25.0/749
CPT-3	774	3.0/771
CPT-4	775	33.0/742
CPT-5	775	6.0/769
CPT-6	776	16.0/760
CPT-7	776	5.0/771
BA-1	776	45/731
BA-2	776	40/736
BA-3	777	22/755

* Based on elevation of existing grade estimated from Preliminary Grading Plan (Pacific Soils, November 1998).

Based on the SPT at the boring locations and CPT results, the existing fills are inferred to be in a medium dense state and uniformly compacted, and the underlying sandstone bedrock are inferred to be in a very dense state. Downhole logging of the bucket auger borings revealed the horizontal contact between the fill and underlying bedrock.

5.2 Groundwater Conditions

No groundwater was encountered within the sixty-nine and one-half (69.5) foot depth of exploration at the time of the investigation; however, groundwater conditions may be altered by geologic detail between borings, by seasonal and meteorological variations, and by construction activity.

Groundwater was encountered at approximately forty-five (45) feet below existing grade (ninety-five [95] feet below present grade) at boring SB-8, while no groundwater was encountered within the seventy-one (71) foot deep exploration at boring SB-4 drilled in November 1995 (Pacific Soils revised November 18, 1998). At the approximate location of boring SB-8, local seepage was reported in the alluvium along the easterly side of the property during clean-out.

Anticipated high groundwater level contours shown on the El Toro Quadrangle of the Seismic Hazard Zone Report prepared by California Division of Mines and Geology, published in 1998 is presented in Figure A-6, Appendix A. These contours mimic the shallow groundwater observed in the alluvial drainages and are consistent with borings advanced at the site and observations during grading.

VI. SEISMOLOGY CONDITIONS

6.1 Site Accelerations - Mapped Accelerations and Response Spectra

6.1.1. *Site Classification*

The depth of fill ranges up to sixty-three (63) feet in the eastern portion of the site. The SPT blow counts within the fill is in the order of twenty-five (25) to thirty (30) (between fifteen [15] and fifty [50]). Therefore, based on the soil classification procedure recommended by CBC 2010, for determination of site accelerations, the subsoils within the top 100 feet at the site are judged to be Type D.

6.1.2 *Mapped Accelerations Response Spectra*

Mapped MCE spectral response accelerations for 0.2 and 1.0 second periods are provided in maps published in the ASCE 7-05, which is the reference used in the CBC 2010 standard. These maps are prepared by the USGS and the California portion of the map was prepared jointly with the CGS. These maps use results of seismic hazard

analyses from both probabilistic and deterministic procedures, and are applicable to site Class B and five (5) percent of critical damping. The mapped site accelerations are adjusted for site class effects using parameters Fa and Fv, which are a function of site class and mapped site spectral accelerations.

Mapped spectral response parameters may also be obtained using computer programs that can determine these parameters for selected site coordinates. The computer program Seismic Hazard Curves and Uniform Hazard Response Spectra version 5.0.1 dated February 10, 2011 was used to obtain mapped parameters for the project site.

The project site is Site Class D and coefficient values Fa and Fv of 1.0 and 1.5, respectively, are obtained for the site. Mapped MCE accelerations obtained for the project site are summarized in Table II.

TABLE II
MCE MAPPED ACCELERATIONS

PERIOD (SECONDS)	MCE MAPPED ACCELERATION PARAMETERS (g)	SITE CLASS D MCE ACCELERATIONS ADJUSTED FOR SITE CLASS EFFECTS (g)
PGA	0.558	0.558
0.2	S_s: 1.394	1.394
1	S_1: 0.500	0.749

Based on the above, the mapped spectral response accelerations, adjusted for site Class D, S_{MS} and S_{M1} are 1.394g and 0.749g, respectively.

6.1.3 *Design Spectra Based on the Mapped Parameters*

Section 11.4.5 of ASCE 7-05 describes a procedure to obtain a design response spectra curve for use in cases where a design response spectrum is required by the ASCE 7-05 standard, and site-specific ground motion procedures are not used. This procedure is based on the use of the mapped spectral response accelerations adjusted for site class effects, in the determination of the design response spectrum curve. The ASCE 7-05 specifies the design spectral response acceleration at any period as two-thirds (2/3) of the site specific MCE spectral response acceleration. Design spectral response accelerations based on the mapped parameters are given in Table III.

TABLE III
MAPPED DESIGN SPECTRAL RESPONSE ACCELERATIONS (g)

Period (Seconds)	Mapped Design Spectral Response Accelerations (g)
0.000 (PGA)	0.374
0.108	0.934
0.200 (S_{DS})	0.934
0.538	0.934
0.600	0.837
0.700	0.717
0.800	0.628
0.900	0.558
1.000 (S_{D1})	0.502
1.100	0.456
1.200	0.418
1.300	0.386
1.400	0.358
1.500	0.335
1.600	0.314
1.700	0.29
1.800	0.279
1.900	0.264
2.00	0.254

Based on the above data, design response spectra parameters are obtained as follows:

PGA: 0.374g
S_{DS}: 0.934g
S_{D1}: 0.502g

6.2 Earthquake Effects

6.2.1 *Liquefaction*

Liquefaction occurs when the pore pressures generated within a soil mass equals the overburden pressure. This results in a loss of strength and the soil then possesses a certain degree of mobility.

Factors considered to evaluate liquefaction potential include groundwater conditions, soil type, particle size distribution, earthquake magnitude and acceleration, and soil density obtained through the Standard Penetration

est (SPT). Soils subject to liquefaction comprise saturated fine grained sands to coarse silts. Coarser-grained soils are considered free-draining and therefore dissipate excess pore pressures, while fine-grained soils posses undrained shear strength.

The USGS/CGS Seismic Hazard Zones Map indicates that the project site is not located in an area subject to liquefaction; Figure A-7, Appendix A. Further, the underlying bedrock and density of the fill, as observed from SPT blow counts and CPT testing, indicate that the subsoils at the site do not posses a potential for liquefaction.

6.2.2 *Seismically Induced Settlement*

Seismically induced ground settlements at the boring locations were evaluated using procedures outlined by Tokimatsu and Seed (1987) and a peak ground acceleration of 0.38g. The results, presented in Appendix D, indicate that the seismic settlements, resulting from dynamic shaking of cohesionless soils, would not exceed one-half (0.5) inch. Associated differential settlements are not anticipated to exceed three-tenths (0.3) of one (1) inch over a distance of thirty (30) feet.

6.2.3 *Tsunamis, Inundation, Seiche, and Flooding*

The site is not located within a coastal area. Therefore, tsunamis (seismic sea waves) are not considered a significant hazard at the site.

According to the Federal Emergency Management Agency (FEMA), December 3, 2009, Flood Insurance Rate Map, City of Lake Forest, California, the proposed project site is located outside the 100 year-flood-zone (Figure A-8, Appendix A).

6.2.4 *Surface Rupture*

The site is not located within any of the Alquist-Priolo Earthquake Fault Zone maps. The likelihood of direct surface fault rupture at the site is considered very low based on the presently known tectonic framework. Cracking due to shaking from distant events is not considered a significant hazard, although it is a possibility at any site.

6.2.5 *Landsliding*

The site lies far enough from the nearest significant upland slopes to preclude the hazards of induced landsliding. Further, the El Toro Quadrangle landslide inventory map (CDMG, 1997, Revised 2001), reproduced herein as Figure A-9, Appendix A, shows that the site is not located adjacent to any landslides existing prior to grading.

6.2.6 *Lateral Spreading*

Seismically induced lateral spreading involves primarily movement of earth materials due to ground shaking. Lateral spreading is demonstrated by near-vertical cracks with predominantly horizontal movement of the soil mass involved. The potential for liquefaction at the site is considered very low. Therefore, the potential for lateral spreading at the subject site is considered very low.

VII. CONCLUSIONS

Based on the results of our site investigations, it is our opinion that the site is geotechnically suitable for the proposed development. The following observations which may influence design and construction decisions were noted:

- A "Restricted Use Area" was recommended by Pacific Soil Engineering, Inc. along the southern and eastern boundaries of the project site. Structural improvement to be built within this "Restricted Use Area" should be designed for differential settlement of up to two and one-half (2.5) inches in fifty (50) feet. The "Restricted Use Area" is shown as the shaded area on Figure A-3, Appendix A.

- Surface parking is planned in the restricted use area described above. This is considered appropriate provided that future maintenance can be tolerated.

- Approximately forty-five (45) feet of fill was encountered at boring BA-1 location, at the southern corner and outside of the proposed MOB.

- An erosion gully, off-site, up to approximately twelve (12) feet wide and three (3) to five (5) feet deep was observed in 2003 on the slope surface at the junction of Lake Forest Drive and the on-ramp to the Foothill Transportation Corridor. This erosion gully is now vegetated with small trees and brush; however, if the erosion of the slope resumes, it will affect the stability of the slope and may eventually encroach into the property.

VIII. SITE DEVELOPMENT RECOMMENDATIONS

8.1 General

The proposed development, outlined in Section II, is feasible from a geotechnical engineering standpoint. Project plans and specifications should take into account the appropriate geotechnical features of the site and conform to the recommendations of the geotechnical report.

8.2 Clearing

All surface vegetation, trash and debris should be cleared and removed from the site. The existing fill soils, where removed, may be re-used as structural fill provided that they do not contain any deleterious materials or particles over six (6) inches in largest dimension. Topsoil and soils with organic inclusions are not considered suitable for reuse as structural fill, but it may be stockpiled for future use.

Underground facilities such as utilities, pipes or underground storage tanks may exist at the site. Removal of underground tanks is subject to state law as regulated by County or City Health and/or Fire Department agencies. If storage tanks containing hazardous or unknown substances are encountered, the proper authorities must be notified prior to any attempts at removing such objects.

Septic tanks should be removed in their entirety. Cesspools or seepage pits should be pumped of their contents and removed in their entirety. Any wells, if encountered during construction, should be exposed and capped in accordance with the requirements of the regulating agencies.

Depressions resulting from the removal of foundation of existing structures, buried pipes, obstructions and/or tree roots should be backfilled with properly compacted material.

8.3 Subgrade Preparation

8.3.1 *Building Structure*

The proposed building pad area is partly underlain by sandstone bedrock and partly underlain by compacted fill (i.e. transition lot). Therefore, to alleviate cut/fill transition, the materials should be over excavated to provide a uniformly compacted fill blanket a minimum of three (3) feet in thickness below slab subgrade or below the footing bases, whichever is greater. The lateral extent of overexcavation beyond the proposed building pad limits should be at least equal to the depth of fill.

Subsequent to preparation of the exposed surface soils, as described in subsection 8.4.1, the overexcavation may be backfilled with soils compacted in accordance with the recommendations provided in subsection 8.4.2.

Construction activities and exposure to the environment can cause deterioration of compacted subgrades. Therefore, it is recommended that the condition of the subgrade soils be observed and/or tested by GEOBASE immediately prior to slab-on-grade and pavement construction.

8.3.2 *Walkways, Driveways, Patios and Pavement Areas*

The subsoils beneath walkways, driveways, patios and pavement areas should be over-excavated to facilitate construction of a one (1) foot thick compacted fill blanket. The lateral extent of over-excavation should be at least equal to the depth of fill.

8.4 Fill Placement

8.4.1 *Preparation of Surface Soils*

Prior to placing any fill, the exposed surface soils should be scarified to a minimum depth of eight (8) to ten (10) inches, moisture-conditioned (wetted or dried) to at least optimum moisture content and compacted to a minimum of ninety (90) percent relative compaction based on ASTM D 1557.

8.4.2 *Compaction*

Cohesive soils should be placed in loose lifts not exceeding six (6) inches, moisture-conditioned to approximately two (2) to four (4) percentage points above optimum moisture content, and compacted to the minimum densities listed in Table IV below.

TABLE IV
COMPACTION REQUIREMENTS

TYPE OF FILL/AREA	RELATIVE COMPACTION (ASTM D 1557) MINIMUM PERCENT
Fills within building pad area ***and*** below footing base elevations	95
All other structural fill	90

Granular fill materials should be placed in loose lifts of six (6) to eight (8) inches, moisture-conditioned to near-optimum, and compacted to the minimum densities listed in the preceding table.

8.4.3 *Fill Material*

The on-site soils have a "very low" expansion potential (Expansion Indices = 4 and 19). The on-site soils may be reused as compacted fill provided they are free of organics, deleterious materials, debris and particles over six (6) inches in largest dimension.

Any soils imported to the site for use as fill for subgrade materials should be predominantly granular and non expansive (Expansion Index less than 20) and should contain sufficient fines (approximately twenty [20] percent)

so as to be relatively impermeable when compacted. The imported soils should be approved by GEOBASE, INC. (GEOBASE) prior to importing. Laboratory testing required for approval of import sources may require forty-eight (48) hours. GEOBASE should be notified of import locations a minimum of seventy-two (72) hours prior to its proposed use.

8.4.4 *Shrinkage*

The on-site soils will undergo some volume change when excavated and replaced as properly compacted fill. Since an accurate determination of in-place and compacted densities cannot be made over the entire project area, accurate earthwork shrinkage estimates cannot be provided. Based on our experience with similar soils, a shrinkage value in the order of ten (10) to twenty-five (25) percent may be used as a guideline for the on-site soils.

8.5 Slope Stability

The existing soil slopes, off-site, along the eastern and southern site boundaries, adjacent to the Lake Forest Drive and on-ramp to the Foothill Transportation Corridor vary from six (6) to twenty-five (25) feet in height and have a slope ratio of 2H:1V (Horizontal: Vertical). The slope surfaces are covered with landscape grasses and bushes with small trees. It should be pointed out that the erosion gully, up to approximately twelve (12) feet wide and three (3) to five (5) feet deep, was observed in 2003 on the slope surface at the junction of Lake Forest Drive and on-ramp to the Foothill Transportation Corridor, is now vegetated with small trees and bushes. It is understood that these slopes are located outside of the property lines; however, if erosion of the slope resumes, it will affect the stability of the slope and may encroach into the property.

Based on the grading report (Pacific Soils, November 1998) and Response to OCEMA Review Sheet (Pacific Soils, January 1995), all the existing cut-and-fill slopes within and surrounding the project site were constructed in accordance with the criteria of the County of Orange and are considered to be grossly and surficially stable.

8.6 Surface Drainage

To enhance future site performance, it is recommended that all pad drainage be collected and directed away from proposed structures to disposal areas off-site. For soils areas, we recommend that a minimum of five (5) percent gradient away from foundation elements be maintained. It is important that drainage be directed away from foundations and that proper drainage patterns be established at the time of construction and maintained throughout the life of the structures.

Care should be exercised in controlling surface runoff onto permanent and temporary slopes. The area back of the slope crest should be graded such that water will not be allowed to flow freely onto the slope face. If excavations of temporary slopes are carried out in the rainy season, appropriate erosion protection measures may

be required to minimize erosion of the slope cuts.

8.7 Temporary Excavations

Temporary construction excavations are anticipated for construction of utility trenches and footings.

Temporary construction excavations in soils may be made vertically without shoring to a depth of approximately four (4) feet below adjacent surrounding grade. For deeper cuts in soils, the slopes should be properly shored or sloped back at least 1H:1V (Horizontal: Vertical) or flatter. The exposed slope face should be kept moist (but not saturated) during construction to reduce local sloughing. No surcharge loads should be permitted within a horizontal distance equal to the height of cut from the toe of excavation unless the cut is properly shored. Excavations that extend below an imaginary plane inclined at forty-five (45) degrees below the edge of any nearby adjacent existing site facilities including underground pipelines, should be properly shored to maintain foundation support of the adjacent structures and utilities.

All excavations and shoring systems should meet, as a minimum, the requirements given in the State of California Occupational Safety and Health Standards. Stability of temporary slopes are the responsibility of the contractor.

8.8 Trench Backfill

It is our opinion that utility trench backfill could be placed and compacted by mechanical means. Jetting or flooding of backfill material is not recommended.

If utility contractors indicate that it is undesirable to use compaction equipment in close proximity to a buried conduit, other methods of utility trench compaction may also be appropriate, as approved by the geotechnical engineer at the time of construction.

IX. FOUNDATION RECOMMENDATIONS

9.1 General

The following recommendations have been formulated from visual, physical and analytical considerations of existing site conditions and are believed to be applicable for the proposed development.

The on-site soils possess a "very low" expansion potential. The following recommendations are based on a "very low" expansion potential for the surface soils. Foundation and slab reinforcement configurations should meet, as a minimum, the requirements of the governing agencies or Uniform Building Code.

9.2 Footings

Footings based on properly compacted fill soils may be used to support the proposed structure provided that a uniform compacted fill blanket is completed in accordance with the requirements described in subsection 8.3.1. Planters adjacent to footings should be avoided unless they are lined and landscape water is allowed to drain to a suitable discharge point.

9.2.1 *Soil Bearing Pressure*

Spread and continuous footings based on properly compacted fills, a minimum of eighteen (18) inches below lowest adjacent grade, may be designed for an allowable dead-plus-live load bearing pressure of 2,000 psf. These bearing pressures may be increased by one-third (1/3) for short-term wind or seismic loads. The maximum edge pressures induced by eccentric loading or overturning moments should not be allowed to exceed the aforementioned allowable bearing values.

Footings placed closer than one (1) width apart should be structurally tied.

9.2.2 *Footings Adjacent to Trenches or Existing Footings*

Where footings are located adjacent to utility trenches, they should extend below a one-to-one plane projected upward from the inside bottom corner of the trench. Footing excavations adjacent to the footing of the existing structures should be carried out such that the existing footings are not undermined.

9.2.3 *Settlement*

For the bearing pressures provided above and based on the building location shown on Figure A-2, Appendix A, the total and differential settlements are not anticipated to exceed one (1) inch and one-half (½) inch over a distance of thirty (30) feet, respectively.

9.2.4 *Lateral Load Resistance*

Lateral loads against structures may be resisted by friction between the bottom of foundations and the supporting soils. An allowable friction coefficient of 0.25 is recommended. An allowable lateral bearing pressure equal to an equivalent fluid weight of 150 pounds per cubic foot acting against the foundations may be used, provided the foundations are poured tight against undisturbed or compacted soil.

9.2.5 *Footing Observations*

All foundation excavations should be observed by GEOBASE prior to the placement of forms, reinforcement, or

concrete, for verification of conformance with the intent of these recommendations. The on-site sandy soils may make footing excavation difficult, and care should be taken in excavation for footings to avoid excessive loosening of the soils. All loose or unsuitable material should be removed prior to the placement of concrete. Materials from footing excavations should not be spread in slab-on-grade areas unless compacted.

9.3 Floor Slabs

Concrete slab-on-grade floors may be used for the proposed buildings. The subgrade for the floor slab should be prepared in accordance with the recommendations provided in subsections 8.3 and 8.4. In moisture-sensitive areas the slab should be waterproofed.

The recommendations presented above are intended to reduce the potential for cracking of slabs and foundations; however, even with the incorporation of the recommendations presented herein, foundation slabs may still exhibit some cracking. The occurrence of concrete shrinkage cracks are independent of the supporting soil characteristics.

A subgrade modulus of 150 pounds per cubic inch may be used for slab design. The slab should be designed and reinforced by the structural engineer for temperature and shrinkage stresses, the various anticipated loadings including construction and operating conditions, and the "very low" expansion potential of the subgrade soils. As a minimum, the slab should be five (5) inches in actual thickness and reinforced with number four (4) bars at twelve (12) inches each way.

X. PAVEMENT SECTIONS, WALKWAYS AND FLATWORK AREAS

Two (2) R-value test were performed and gave results of twenty-seven (27) and forty-three (43). Based on an R-value of twenty-seven (27), the following alternative preliminary minimum pavement sections may be used. The traffic index assumed in Table V should be confirmed by the Civil Engineer and additional R-value tests should be performed during grading, prior to finalizing the pavement section. The pavement section should be revised if either the traffic index or the as-graded soils are significantly different from the soil samples tested.

TABLE V
ALTERNATIVE PAVEMENT SECTIONS

PAVEMENT UTILIZATION	TRAFFIC INDEX	CRUSHED AGGREGATE BASE (INCHES)	ASPHALTIC CONCRETE (INCHES)
Automobile parking areas and driveways	4.5	5	3
Truck and bus loading/unloading areas and driveways	5.5	7	3

The crushed aggregate base must meet specifications per Standard Specifications for Public Works Construction

or CALTRANS Class II, and should be compacted to at least ninety-five (95) percent relative compaction based on ASTM D 1557. Crushed miscellaneous base should not be used.

XI. SOIL CORROSIVITY -- IMPLICATIONS

Electrical conductivity, pH, chloride and water soluble sulfate tests were conducted on representative samples by Anaheim Test Laboratory, and the results are provided in Appendix C. The tests results indicate that the subsoils at the site have a "low" to "moderate" corrosive potential with respect to concrete and "moderate" to "very severe" corrosion potential with respect to steel and other metals. Type II Portland cement should be used for the construction of concrete structures in contact with the subgrade soils.

XII. PERCOLATION RATE OF THE SUBSOILS

The site location map is given as Figure A-1, Appendix A. The percolation test locations are shown on Figure 1 of the percolation tests report provided in Appendix D.

The following minimum recorded percolation rates may be used for design purposes:

PERCOLATION BORING LOCATION	PERCOLATION RATE (GALLON/SQUARE FOOT/DAY)
B-1	0.1
B-2	0.2
B-3	0.4

XIII. LIMITATIONS

This investigation was performed in accordance with generally accepted geotechnical engineering principles and practices. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

This report is intended for use by the client and its representatives, and with regard to the specific project discussed herein. Any changes in the design or location of the proposed new structure, however slight, should be brought to our attention so that we may determine how they may affect our conclusions. The conclusions and recommendations contained in this report are based on the data relating only to the specific project and location discussed herein. This report does not relate any conclusions or recommendations about the potential for hazardous and/or contaminated materials existing at the site.

The analyses and recommendations submitted in this report are based upon the observations noted during drilling of the borings, interpretation of laboratory test results, and geological evidence. This report does not reflect any

variations which may occur away from the borings and which may be encountered during construction. If conditions observed during construction are at variance with the preliminary findings, we should be notified so that we may modify our conclusions and recommendations, or provide alternate recommendations, if necessary.

The recommendations presented herein assume that the plan review, observations and testing services, outlined in Section XII of the report, will be provided by GEOBASE. During execution of the aforementioned services, GEOBASE can finalize the report recommendations based on observations of actual subsurface conditions evident during construction. GEOBASE cannot assume liability for the adequacy of the recommendations if another party is retained to observe construction.

This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project, and incorporated into the plans and specifications. In this respect, it is recommended that we be allowed the opportunity to review the project plans and the specifications for conformance with the geotechnical recommendations.

This office does not practice or consult in the field of safety engineering. We do not direct the contractor's operations, and we cannot be responsible for other than our own personnel on the site. Therefore, the safety of others is the responsibility of the contractor. The contractor should notify the owner if he considers any of the recommended actions presented herein to be unsafe.

This report may be subject to review by the appropriate regulating agencies.

Respectfully submitted
GEOBASE, INC.

H. D. Nguyen, B.Sc.
Project Engineer

J-M. Chevallier, P.E., G.E.
R.C.E. 39198; G.E. 2056
Managing Principal

REFERENCES

1. Pacific Soils Engineering, Inc., December 1994. "Geotechnical Investigation and Grading Plan Review, Planning Area 8, a Portion of Tentative Tract 13419, Foothill Ranch, County of Orange, California". A report prepared for the Foothill Ranch Company.

2. Pacific Soils Engineering, Inc., January 1995, "Response to OCEMA Review Sheet, dated January 9, 1995, Addressing the Reference 1 Report", a response prepared for the Foothill Ranch Company.

3. Pacific Soils Engineering, Inc., February 1996, Revised November 1998, "Report of Findings, Planning Area 8, a Portion of Tentative Tract 13419, Foothill Ranch, County of Orange, California" a report prepared for the Foothill Ranch Company.

4. Pacific Soils Engineering, Inc., November 1998, "Project Grading Report, Lots 105 through 108 and the Adjacent Portion of Towne Center Drive, Planning Area 8, a Portion of Tentative Tract 13419, Foothill Ranch, County of Orange, California" a report prepared for Foothill Ranch Company.

5. California Division of Mines and Geology, January 17, 2001, State of California Seismic Hazard Zones – Official Map of the El Toro Quadrangle, Scale 1: 24,000.

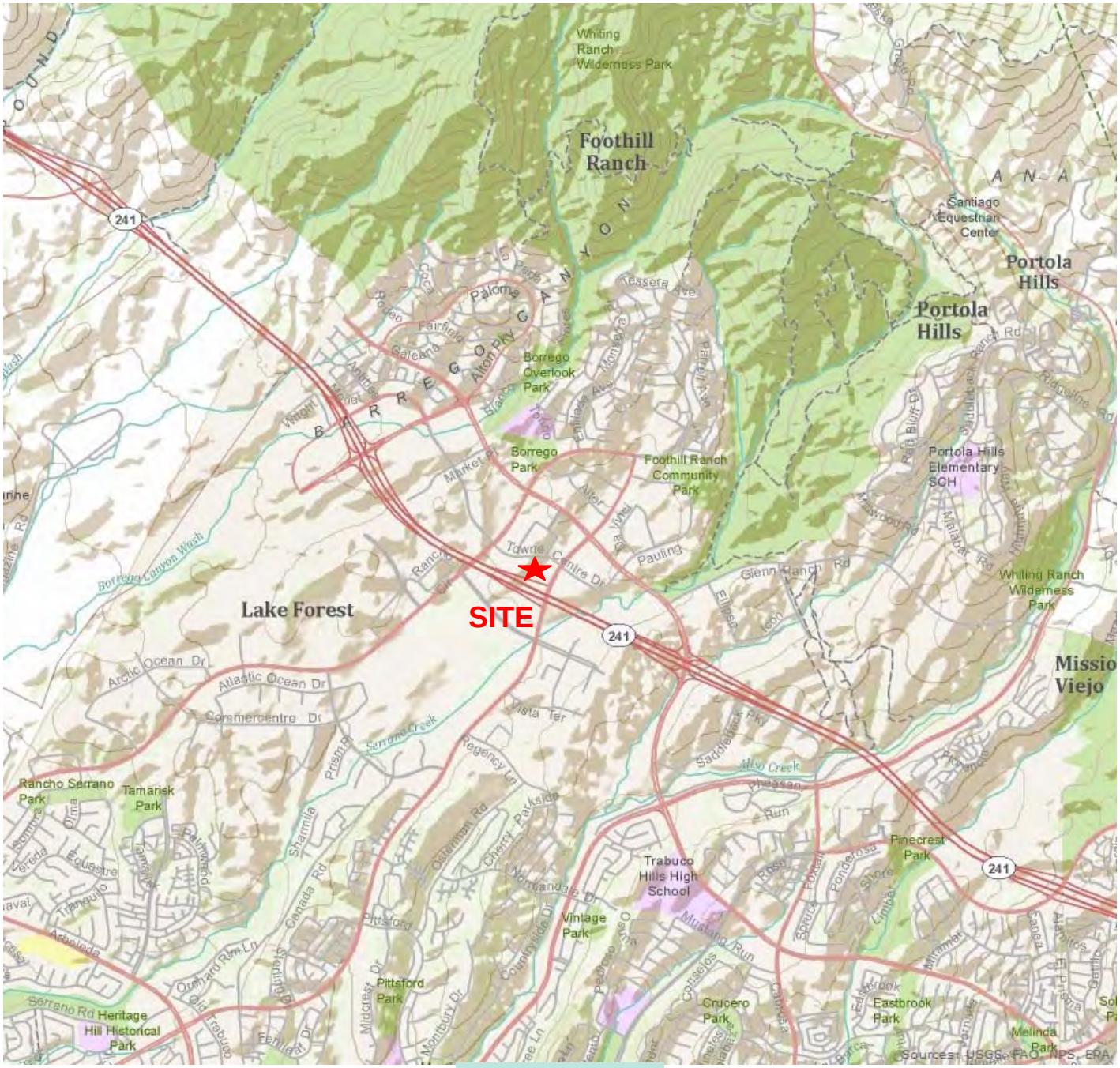
6. California Division of Mines and Geology, 1997c (Revised 2001), Seismic Hazard Evaluation of the El Toro 7.5-Quadrangle, Orange County, California: CDMG, Open-File Report 2000-013.

7. Pacific Soils Engineering, Inc., April 1996, "Response to Letter from Transportation Corridor Agencies, Regarding Planning Area 8, dated March 1996". A letter prepared for the Foothill Ranch Company.

8. Pradel, D., 1998 "Procedure to Evaluate Earthquake Induced Settlements in Dry Sandy Soils", Journal of Geotechnical and Geoenvironmental Engineering, April 1998, Volume 124, Number 4.

9. Tokimatsu, K., and Seed, H.B., 1987 "Evaluation of Settlements in Sands due to Earthquake Shaking", J. Geotechnical Engineering Division, ASCE, Vol. 113, No. 8, pp. 861-878.

APPENDIX A



Site Coordinates
Latitude: 33.6735
Longitude: -117.661

NORTH

GEOBASE

SITE LOCATION MAP
KAISER PERMANENTE
FOOTHILL RANCH MOB
LAKE FOREST, CALIFORNIA

C.314.41.00

FIGURE A-1

EXPLANATION:

- **B-1** Approximate Location of Boring and CPT (2003)
- **B-2** Approximate Location of Boring (Current Investigation)

NOTES:

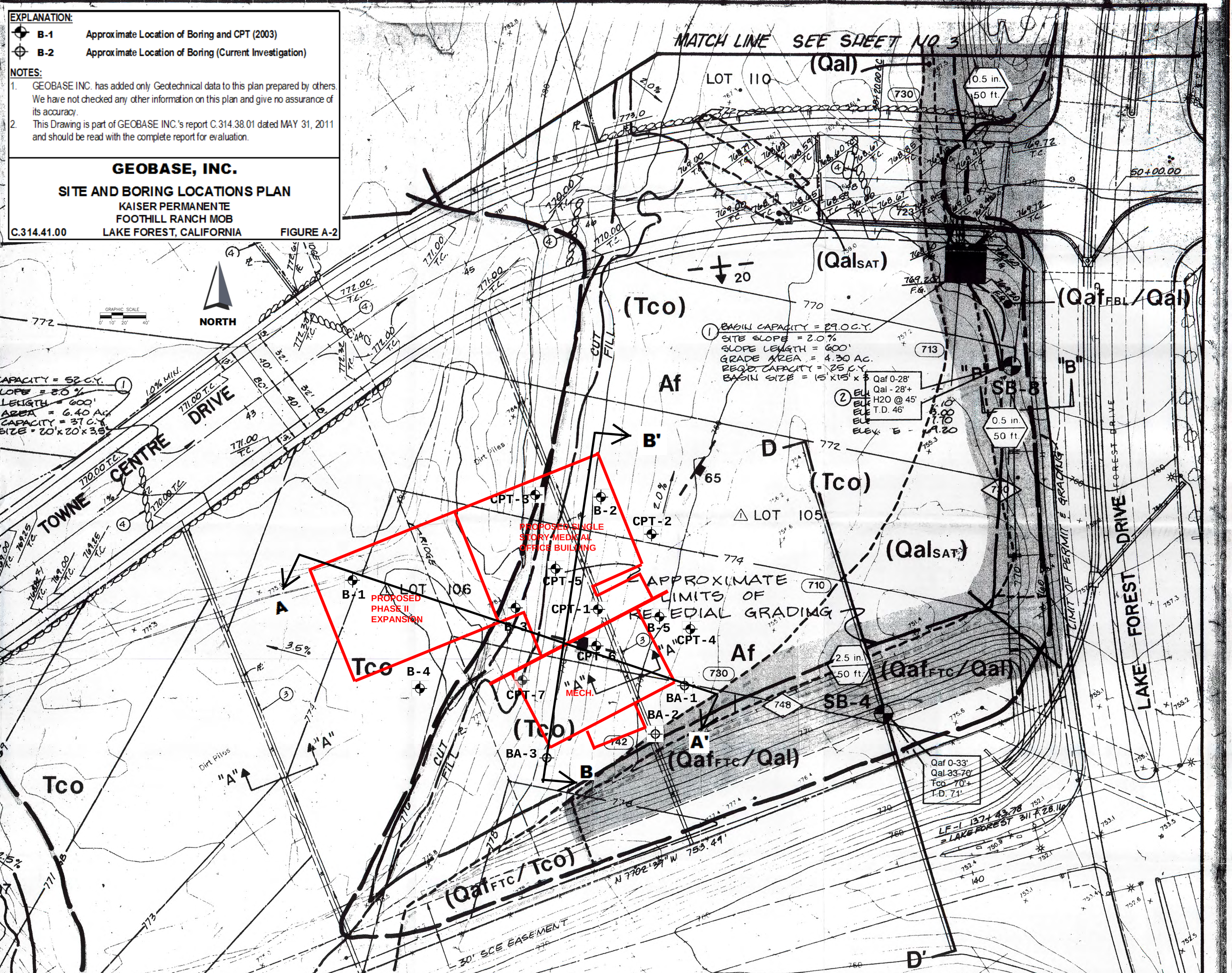
1. GEOBASE INC. has added only Geotechnical data to this plan prepared by others. We have not checked any other information on this plan and give no assurance of its accuracy.
2. This Drawing is part of GEOBASE INC.'s report C.314.38.01 dated MAY 31, 2011 and should be read with the complete report for evaluation.

GEOBASE, INC.

SITE AND BORING LOCATIONS PLAN

KAISER PERMANENTE
FOOTHILL RANCH MOB

C.314.41.00 LAKE FOREST, CALIFORNIA FIGURE A-2



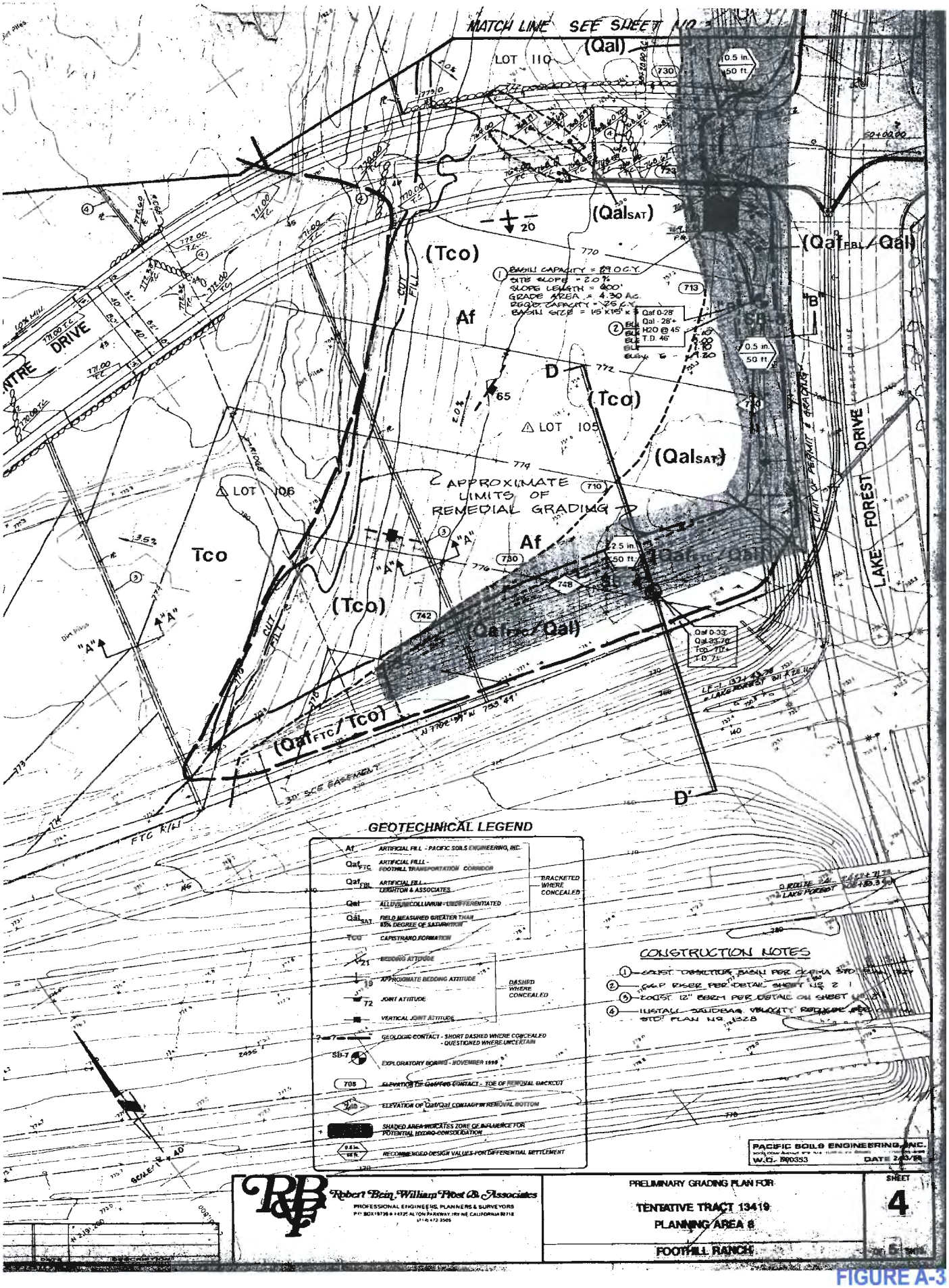
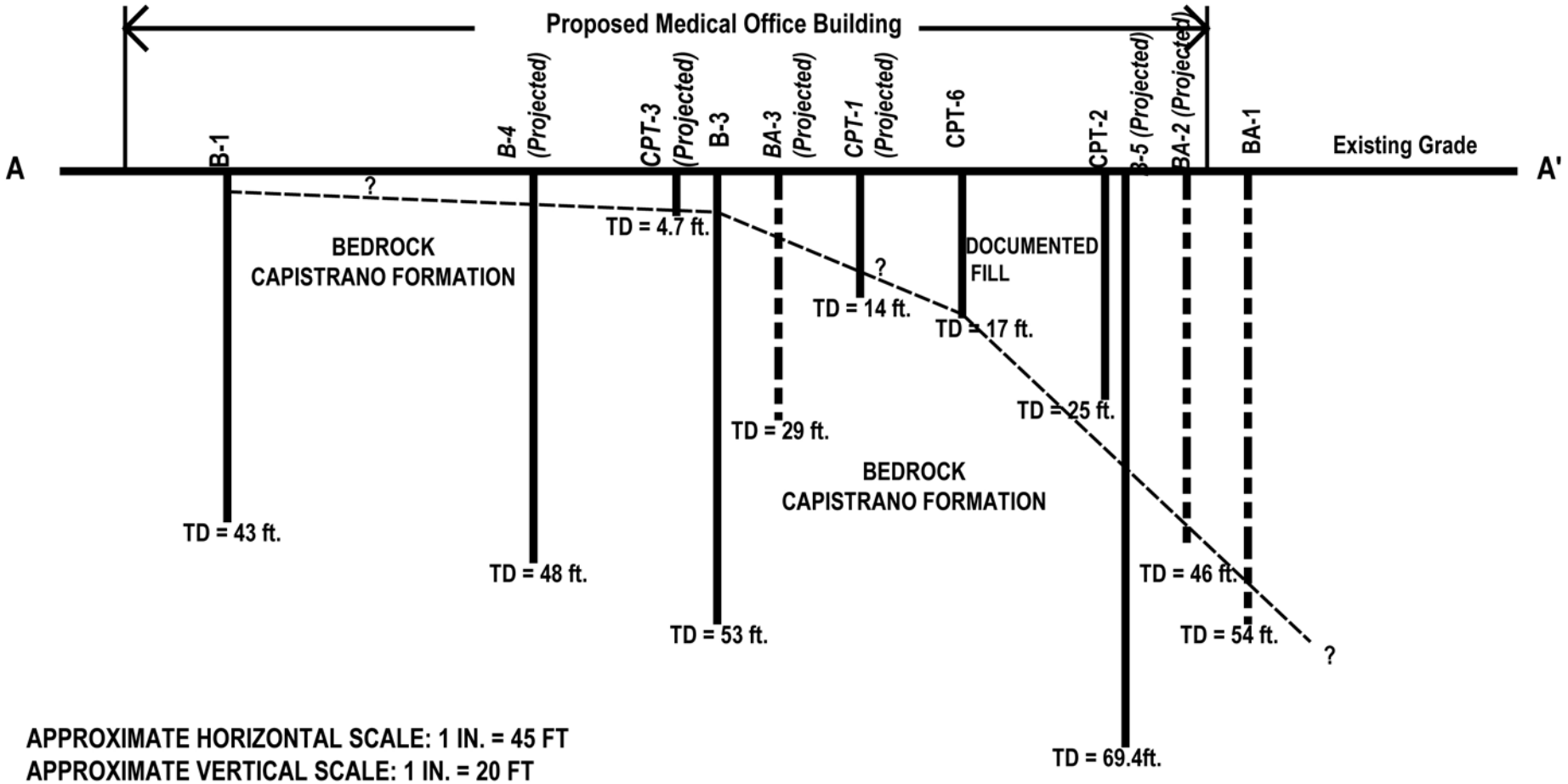

MATCH LINE SEE SHEET 1/2
LOT 110
(Qal)
(Qalsat)
(Tco)
(Qaf FBL / Qal)
Af
LOT 105
LOT 106
Tco
APPROXIMATE LIMITS OF REMEDIAL GRADING
(Qaf FTC / Tco)
30' SCE EASEMENT
LAKE FOREST DRIVE
GEOTECHNICAL LEGEND
CONSTRUCTION NOTES
PACIFIC SOILS ENGINEERING, INC.
W.O. 800393
Robert Bein, William Frost & Associates
PRELIMINARY GRADING PLAN FOR
TENTATIVE TRACT 13419
PLANNING AREA 8
FOOTHILL RANCH
SHEET 4

FIGURE A-3



APPROXIMATE HORIZONTAL SCALE: 1 IN. = 45 FT
APPROXIMATE VERTICAL SCALE: 1 IN. = 20 FT

CROSS-SECTION A-A'

NOTE: Stratigraphic sections are known with accuracy only at the locations observed. The soil stratigraphy between borings has been inferred from geological evidence and may vary from that shown.

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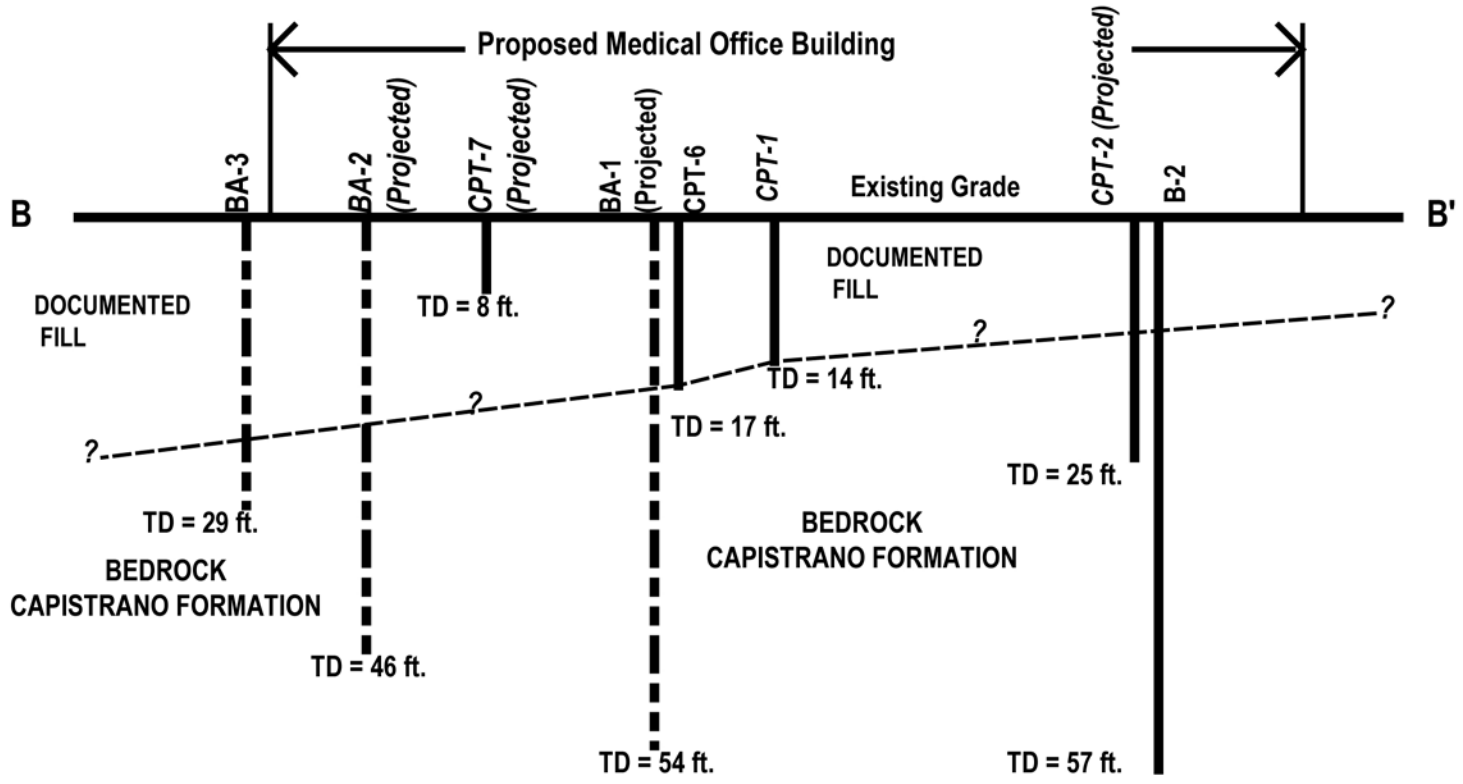
C.314.41.00

CROSS SECTION A-A'
KAISER PERMANENTE
FOOTHILL RANCH MOB
LAKEFOREST, CALIFORNIA

FIGURE A-4



APPROXIMATE HORIZONTAL SCALE: 1 IN. = 45 FT
APPROXIMATE VERTICAL SCALE: 1 IN. = 20 FT

CROSS-SECTION B-B'

NOTE: Stratigraphic sections are known with accuracy only at the locations observed. The soil stratigraphy between borings has been inferred from geological evidence and may vary from that shown.

GEOBASE	C.314.41.00	**CROSS SECTION B-B'** KAISER PERMANENTE FOOTHILL RANCH MOB LAKEFOREST, CALIFORNIA FIGURE A-5

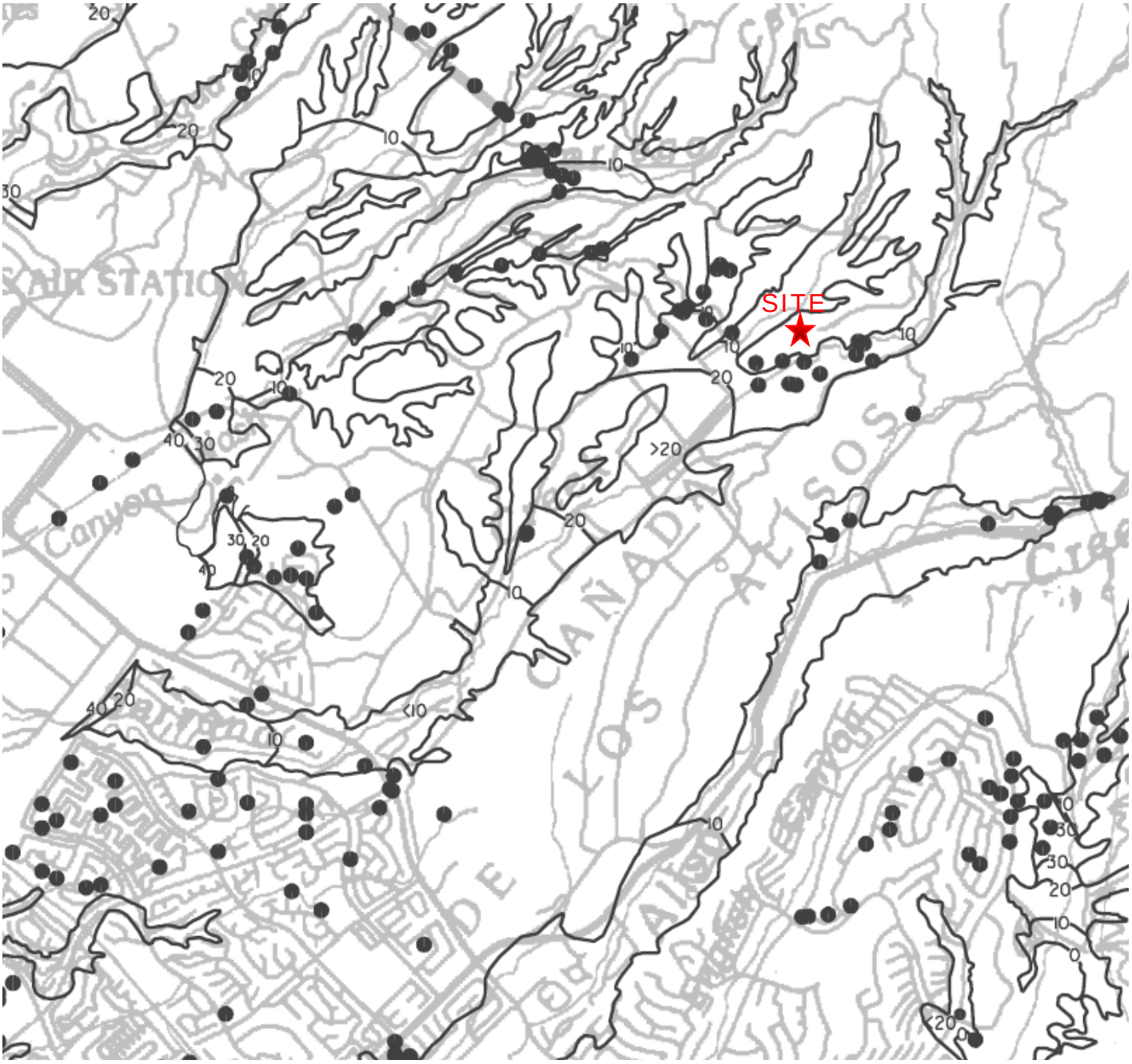


Plate 1.2 Anticipated high ground water levels in the El Toro Quadrangle, Orange County.

● Borehole Site — 30 — Depth to ground water in feet

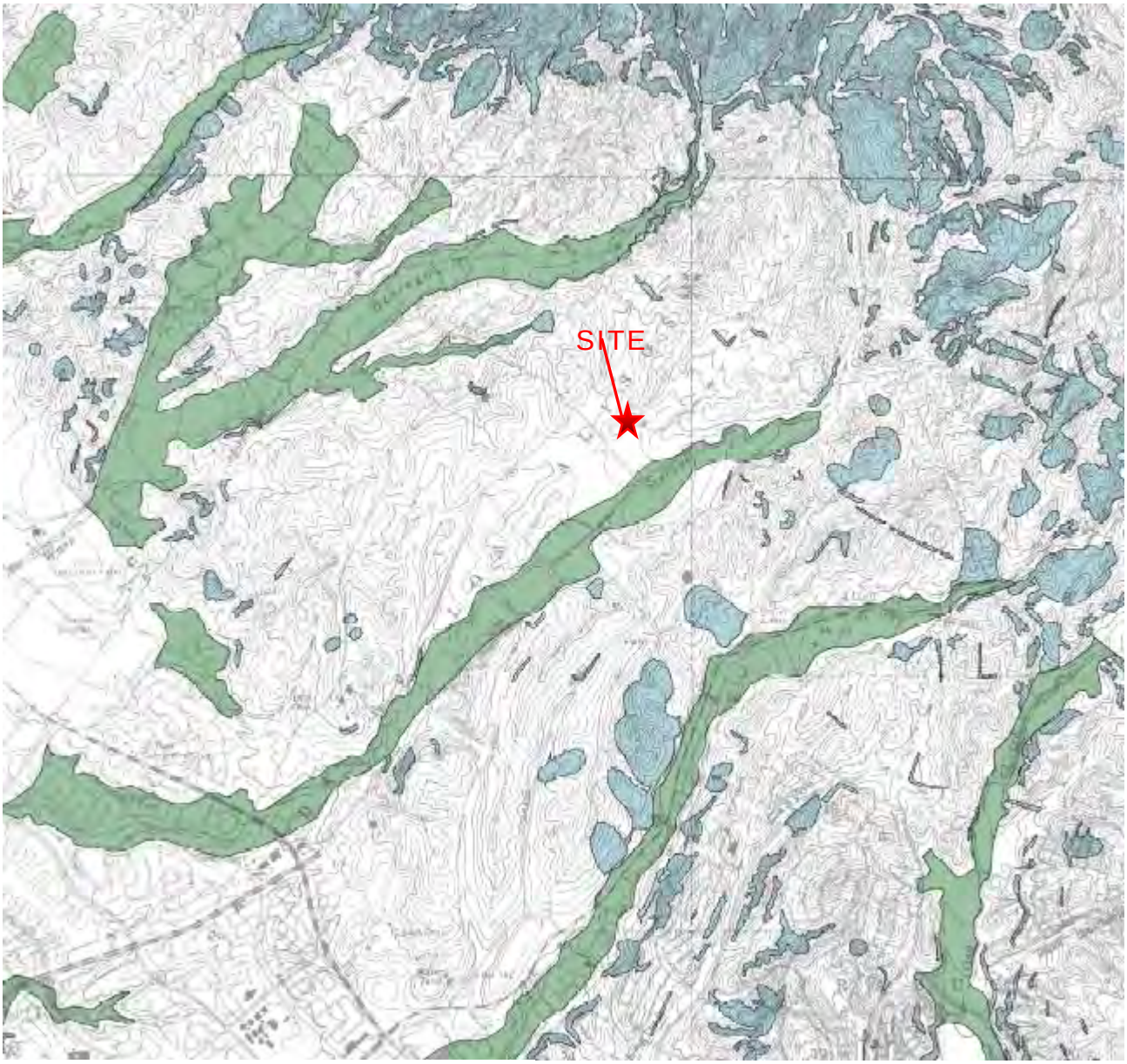
NORTH

ONE MILE

Scale

GEOBASE

ANTICIPATED HIGH GROUNDWATER LEVELS
KAISER PERMANENTE
FOOTHILL RANCH MOB
C.314.41.00 LAKE FOREST, CALIFORNIA FIGURE A-6



SCALE 1:24,000

1 .5 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

NORTH

STATE OF CALIFORNIA
SEISMIC HAZARD ZONES

Delineated in compliance with Chapter 7.8, Division 2 of the California Public Resources Code (Seismic Hazards Mapping Act)

EL TORO QUADRANGLE

OFFICIAL MAP

Released: January 17, 2001

Site Coordinates:
Latitude: 33.6735
Longitudes: -117.661

MAP EXPLANATION

Zones of Required Investigation:

Liquefaction
Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake-Induced Landslides
Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

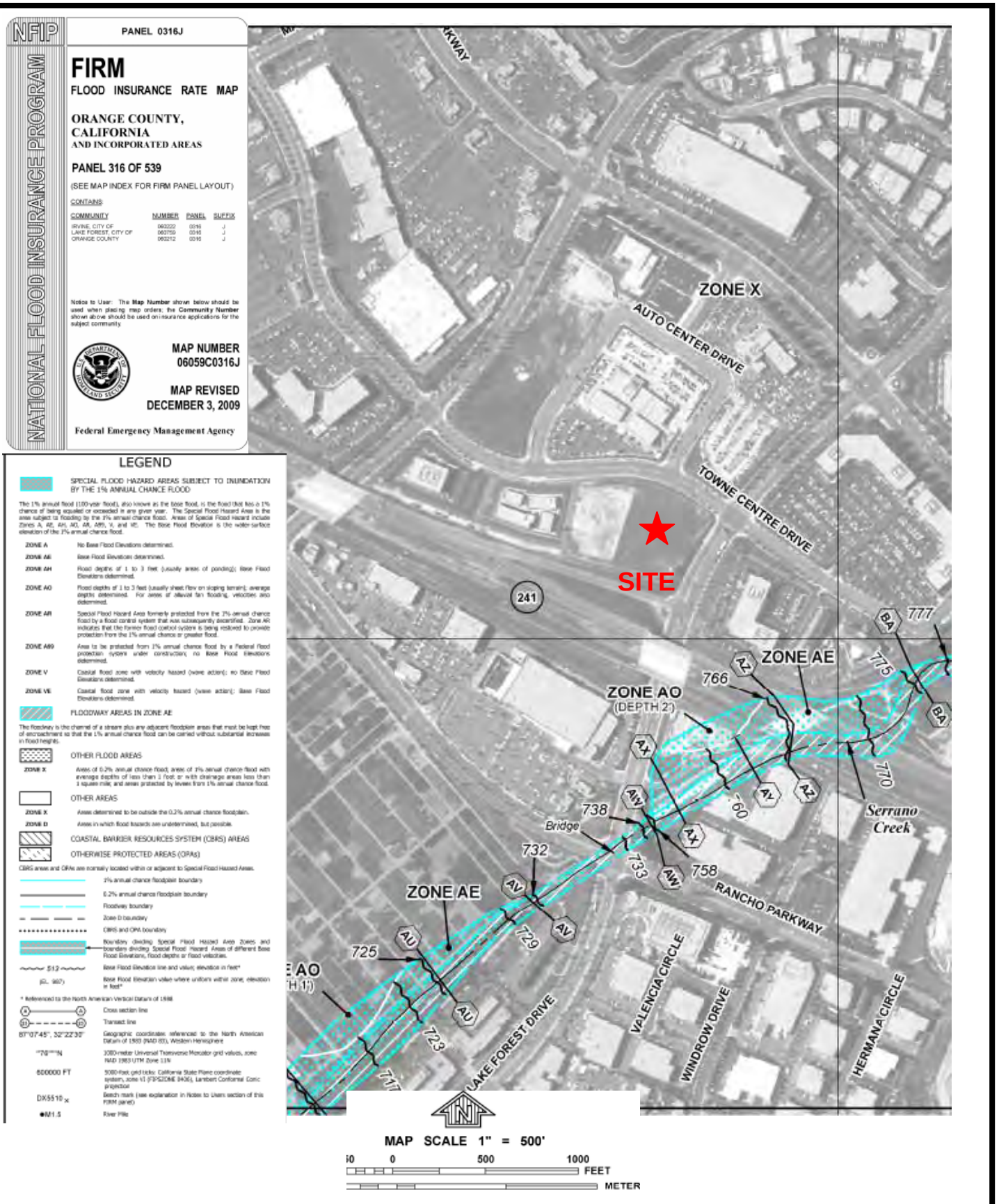
GEOBASE

SEISMIC HAZARD ZONES MAP

KAISER PERMANENTE
FOOTHILL RANCH MOB
LAKE FOREST, CALIFORNIA

C.314.41.00

FIGURE A-7



GEOBASE

FEMA FLOOD MAP
KAISER PERMANENENTE
FOOTHILL RANCH MOB
LAKFOREST, CALIFORNIA

C.314.41.00

FIGURE A-8

Plate 2.1 Landslide inventory, Shear Test Sample Locations, and Areas of Significant Grading, El Toro Quadrangle.

● shear test sample location landslide areas of significant grading tract report with multiple borings

GEOBASE

LANDSLIDE INVENTORY MAP
KAISER PERMANENTE
FOOTHILL RANCH MOB
C.314.41.00 LAKE FOREST, CALIFORNIA FIGURE A-9

APPENDIX B

GEOBASE, March 2003

Pacific Soils, Revised November 1998

GEOBASE, May 2011

The terms and symbols used on the Log of Borings to summarize the results of the field investigation and subsequent laboratory testing are described in the following:

It should be noted that materials, boundaries, and conditions have been established only at the boring locations, and are not necessarily representative of subsurface conditions elsewhere across the site.

A. PARTICLE SIZE DEFINITION (ASTM D2487 AND D422)

Boulder	-- larger than 12-inches	Sand, medium	-- No.40 to No. 10 sieves
Cobble	-- 3-inches to 12-inches	Sand, fine	-- No.200 to No. 40 sieves
Gravel, coarse	-- 3/4-inch to 3-inches	Silt	-- 5µm to No. 200 sieves
Gravel, fine	-- No.4 sieve to 3/4 -inch	Clay	-- smaller than 5 µm
Sand, coarse	-- No.10 to No.4 sieve		

B. SOIL CLASSIFICATION

Soils and bedrock are classified and described according to their engineering properties and behavioral characteristics. The soil of each stratum is described using ASTM D2487 and D2488.

The following adjectives may be employed to define percentage ranges by weight of minor components:

trace	--	1-10%	some	--	20-35%
little	--	10-20%	"and" or "y"	--	35-50%

The following descriptive terms may be used for stratified soils:

parting	--	0 to 1/16-in. thickness;	layer	--	½-in. to 12-in. thickness;
seam	--	1/16 to ½-in. thickness;	stratum	--	greater than 12-in. thickness.

C. SOIL DENSITY AND CONSISTENCY

The density of coarse grained soils and the consistency of fine grained soils are described on the basis of the Standard Penetration Test:

COARSE GRAINED SOILS		FINE GRAINED SOILS		
DENSITY	SPT BLOWS PER FOOT	ESTIMATED CONSISTENCY	SPT BLOWS PER FOOT	ESTIMATED RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TSF)
very loose	less than 4	very soft	less than 2	less than 0.25
loose	5 to 10	soft	2 to 4	0.25 to 0.50
medium	11 to 30	firm (medium)	5 to 8	0.50 to 1.0
dense	31 to 50	stiff	9 to 15	1.0 to 2.0
very dense	over 50	very stiff	16 to 30	2.0 to 4.0
		hard	over 30	over 4.0

GEOBASE

EXPLANATION OF TERMS AND SYMBOLS USED

Figure B-1

D. STANDARD PENETRATION TEST (SPT) -- D1586

The SPT test involves failure of the soil around the tip of a split spoon sampler for a condition of constant energy transmittal. The split spoon, 2-inches outside diameter and 1 3/8-inches inside diameter, is driven eighteen (18) inches. The sampler is seated in the first six (6) inches and the number of blows required to drive the sampler the last foot is recorded as the "N" value or SPT blow count. The driving energy is provided by a 140 pound weight dropping thirty (30) inches.

E. ABBREVIATION OF LABORATORY TEST DESIGNATIONS

C	Consolidation	pH	pH
CBR	California Bearing Ratio	pp	Pocket Penetrometer
Ch	Water Soluble Chlorides	PS	Particle Size
DS	Direct Shear	RV	R-Value
EI	Expansion Index	SE	Sand Equivalent
ER	Electrical Resistivity	SG	Specific Gravity
k	Permeability	SO_4	Water Soluble Sulfates
MD	Moisture	TX	Triaxial Compression
MP	Modified Proctor Compaction Test	TV	Torvane Shear
O	Organic Content	U	Unconfined Compression

F. STRATIFICATION LINES

The stratification lines indicated on the boring logs and profiles represent the ***approximate*** boundary between material types and the transition may be gradual.

SOIL CLASSIFICATION SYSTEM (ASTM D 2487)

MAJOR DIVISION			GROUP SYMBOL	GRAPHIC SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA
HIGHLY ORGANIC SOILS			Pt		Peat and other highly organic soils	Strong color or odor and often fibrous texture
COARSE-GRAINED SOILS (More than half by weight larger than No. 200 sieve size)	GRAVELS (More than half coarse fraction larger than No. 4 sieve size)	CLEAN GRAVELS	GW		Well-graded Gravels, Gravel-Sand mixtures (<5% fines)	$C_u = \frac{D_{60}}{D_{10}} > 4$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$
			GP		Poorly-graded Gravels and Gravel-Sand mixtures (<5% fines)	Not meeting all above requirements
		DIRTY GRAVELS	GM		Silty Gravels, Gravel-Sand-Silt mixtures (>12% fines)	Atterberg limits below "A" line or $I_p < 4$
			GC		Clayey Gravels, Gravel-Sand-Clay mixtures (>12% fines)	Atterberg limits above "A" line or $I_p > 7$
	SANDS (More than half coarse fraction smaller than No. 4 sieve size)	CLEAN SANDS	SW		Well-graded Sands, Gravelly Sands (<5% fines)	$C_u = \frac{D_{60}}{D_{10}} > 6$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$
			SP		Poorly-graded Sands or Gravelly Sands (<5% fines)	Not meeting all above requirements
		DIRTY SANDS	SM		Silty Sands, Sand-Silt mixtures (>12% fines)	Atterberg limits below "A" line or $I_p < 4$
			SC		Clayey Sands, Sand-Clay mixtures (>12% fines)	Atterberg limits above "A" line or $I_p > 7$
FINE-GRAINED SOILS (More than half by weight passes No. 200 sieve size)	SILTS Below "A" line on plasticity chart: negligible organic content		ML		Inorganic Silts and very fine Sands, Rock Flour, Silty Sands of slight plasticity	$W_L < 50$
			MH		Inorganic Silts micaceous or diatomaceous, fine Sandy or Silty soils	$W_L > 50$
	CLAYS Above "A" line on plasticity chart: negligible organic content		CL		Inorganic Clays of low plasticity, Gravelly, Sandy, or Silty Clays, lean Clays	$W_L < 30$
			CI		Inorganic Clays of medium plasticity, Silty Clays	$W_L > 30, < 50$
			CH		Inorganic Clays of high plasticity, fat Clays	$W_L > 50$
	ORGANIC SILTS & ORGANIC CLAYS Below "A" line on plasticity chart		OL		Organic Silts and organic Silty Clays of low plasticity	$W_L < 50$
			OH		Organic Clays of high plasticity	$W_L > 50$

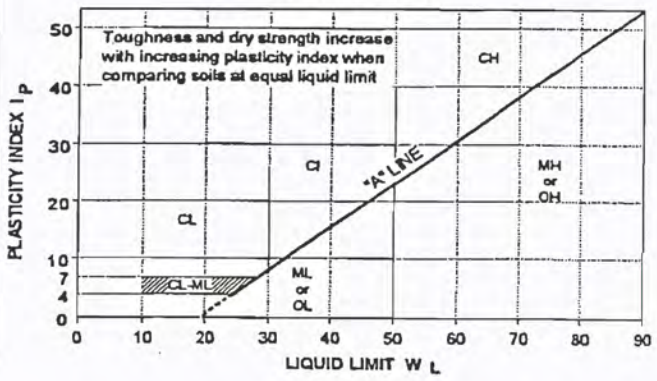
See chart below

The soil of each stratum is described using ASTM D2487 and D2488 modified slightly so that an inorganic clay of "medium plasticity" is recognized.

ADDITIONAL SOIL CLASSIFICATION

- Fill Soil
- Ss Sandstone
- Cs Claystone
- Ms Siltstone

PLASTICITY CHART



GEOBASE

EXPLANATION OF TERMS AND SYMBOLS USED

Figure B-1

LOG OF BORING

SAMPLE TYPE: THIN WALLED TUBE | SPT SPLIT SPOON | CALIFORNIA MODIFIED SAMPLER | DISTURBED | NO RECOVERY | CORE

DEPTH (feet)	SOIL DESCRIPTION	SOIL CLASSIFICATION	REMARKS/ OTHER TESTS
	SAND (FILL), white,some silt, moist.	SM	
	SANDSTONE (BEDROCK), white, some silt, fine to medium grained, massive, friable, very dense, damp to moist.	Ss	Bulk sample from 0 to 5 feet EI, RV
5	... fine to medium grained, very dense.		>> N = 50 blows for 4 inches
			Bulk sample from 5 to 10 feet
10			
			Bulk sample from 10 to 15 feet
15	... very dense.		>> N = 63 blows for 4 inches
			Bulk sample from 15 to 20 feet
20			
25	... very dense.		>> N = 50 blows for 3 inches
30	... silty, fine to medium grained.		
35			

DRY DENSITY (PCF): 80 90 100 110 120

Water Content (%): ●

Plastic Limit (W_P) ⊢——⊣ Liquid Limit (W_L)

Penetration, blows/foot: ■ 10 20 30 40 50

GEOBASE, INC.

PROJECT	**Lake Forest Medical Office Building, Lake Forest, California**		BORING NO. **B-1**
DEPTH TO WATER feet ▼	SURFACE ELEV. **774 feet**	LOGGED BY **RAP**	PROJECT NO. **C.314.06.00**
DEPTH TO SLOUGH ▼	DRILL RIG **CME-75** DRILLER **WESTHAZMAT**	DATE LOGGED **02/19/2003**	FIGURE NO. **B-2**

Note: This log of boring should be evaluated in conjunction with the complete geotechnical report. This log of boring represents conditions observed at the specific boring location and at the date indicated.

LOG OF BORING

SAMPLE TYPE: THIN WALLED TUBE | SPT SPLIT SPOON | CALIFORNIA MODIFIED SAMPLER | DISTURBED | NO RECOVERY | CORE

DEPTH (feet)	GRAPHIC LOG	SOIL DESCRIPTION	SOIL CLASSIFICATION	SAMPLE	DRY DENSITY (PCF) 80 90 100 110 120; Water Content (%); Plastic Limit (W_P) — Liquid Limit (W_L); Penetration, blows/foot: 10 20 30 40 50	REMARKS/ OTHER TESTS
40		SANDSTONE (BEDROCK), white, some silt, fine to medium grained, massive, friable, very dense, moist.	Ss		>> N = 72 blows for 3 inchesw	
45		* End of boring at 43.0 feet. * Auger refusal at 43.0 feet. * Boring dry at completion of drilling.				
50						
55						
60						
65						
70						

GEOBASE, INC.

PROJECT: **Lake Forest Medical Office Building, Lake Forest, California**

DEPTH TO WATER feet ▼

DEPTH TO SLOUGH ▲

SURFACE ELEV. **774 feet**

DRILL RIG **CME-75**

DRILLER **WESTHAZMAT**

LOGGED BY **RAP**

DATE LOGGED **02/19/2003**

BORING NO. **B-1**

PROJECT NO. **C.314.06.00**

FIGURE NO. **B-2**

Note: This log of boring should be evaluated in conjunction with the complete geotechnical report. This log of boring represents conditions observed at the specific boring location and at the date indicated.

LOG OF BORING

SAMPLE TYPE: ■ THIN WALLED TUBE | ▯ SPT SPLIT SPOON | ☒ CALIFORNIA MODIFIED SAMPLER | ▭ DISTURBED | ◣ NO RECOVERY | ▦ CORE

DEPTH (feet)	GRAPHIC LOG	SOIL DESCRIPTION	SOIL CLASSIFICATION	SAMPLE	DRY DENSITY (PCF) 80 90 100 110 120; Water Content (%): ●; Plastic Limit (W_P) ⊢—⊣ Liquid Limit (W_L); Penetration, blows/foot: ■ 10 20 30 40 50	REMARKS/ OTHER TESTS
		SAND (FILL), olive brown, some clay, fine to coarse grained, moist.	SC			Bulk sample from 0 to 5 feet pH, Ch, ER, SO_4
5		... white and brown mix, medium dense.				PS Bulk sample from 5 to10 feet
10		SANDSTONE (BEDROCK), white, some silt, fine to coarse grained, massive, friable, moist.	Ss			Bulk sample from 10 to 15 feet
15		... very dense.			>>■	N = 50 blows for 6 inches Bulk sample from 15 to 20 feet
20						
25		... silty, fine to medium grained, very dense.			>>■	N = 50 blows for 3 inches
30		... fine to coarse grained.				
35						

GEOBASE, INC.

PROJECT	**Lake Forest Medical Office Building Lake Forest, California**		BORING NO. **B-2**
DEPTH TO WATER feet ▼	SURFACE ELEV. **774 feet**	LOGGED BY **RAP**	PROJECT NO. **C.314.06.00**
DEPTH TO SLOUGH ▲	DRILL RIG **CME-75** DRILLER **WESTHAZMAT**	DATE LOGGED **02/20/2003**	FIGURE NO. **B-3**

Note: This log of boring should be evaluated in conjunction with the complete geotechnical report. This log of boring represents conditions observed at the specific boring location and at the date indicated.

LOG OF BORING

SAMPLE TYPE: ■ THIN WALLED TUBE | SPT SPLIT SPOON | ☒ CALIFORNIA MODIFIED SAMPLER | DISTURBED | NO RECOVERY | CORE

DEPTH (feet)	GRAPHIC LOG	SOIL DESCRIPTION	SOIL CLASSIFICATION	SAMPLE	DRY DENSITY (PCF) 80 90 100 110 120; Water Content (%): ●; Plastic Limit (W_P) ⊢—⊣ Liquid Limit (W_L); Penetration, blows/foot: ■ 10 20 30 40 50	REMARKS/ OTHER TESTS
		SANDSTONE (BEDROCK), white, some silt, fine to coarse grained, massive, friable, very dense, moist.	Ss		>> ■	N = 60 blows for 5 inches
40						
45		... fine to medium grained, very dense.			>> ■	N = 50 blows for 4 inches
50						
55					>> ■	N = 60 blows for 6 inches
		* End of boring at 57.0 feet. * Auger refusal at 57.0 feet. * Boring dry at completion of drilling.				
60						
65						
70						

GEOBASE, INC.

PROJECT	**Lake Forest Medical Office Building Lake Forest, California**		BORING NO. **B-2**
DEPTH TO WATER feet ▼	SURFACE ELEV. **774 feet**	LOGGED BY **RAP**	PROJECT NO. **C.314.06.00**
DEPTH TO SLOUGH ▼	DRILL RIG **CME-75** DRILLER **WESTHAZMAT**	DATE LOGGED **02/20/2003**	FIGURE NO. **B-3**

Note: This log of boring should be evaluated in conjunction with the complete geotechnical report. This log of boring represents conditions observed at the specific boring location and at the date indicated.

LOG OF BORING

SAMPLE TYPE: ■ THIN WALLED TUBE ▯ SPT SPLIT SPOON ☒ CALIFORNIA MODIFIED SAMPLER ▤ DISTURBED ◥ NO RECOVERY ▦ CORE

DEPTH (feet)	GRAPHIC LOG	SOIL DESCRIPTION	SOIL CLASSIFICATION	SAMPLE	DRY DENSITY (PCF) 80 90 100 110 120; Water Content (%): ●; Plastic Limit (W_P) — Liquid Limit (W_L); Penetration, blows/foot: ■ 10 20 30 40 50	REMARKS/ OTHER TESTS
		SAND (FILL), brown, some clay, moist.	SC			Bulk sample from 0 to 5 feet
5		SANDSTONE (BEDROCK), white, some silt, friable, cemented, very dense, moist.	Ss		>> ■	N = 50 blows for 4 inches
						Bulk sample from 5 to 10 feet
10					▲	C
						Bulk sample from 10 to 15 feet
15		.. fine to medium grained , damp.			>> ■	N = 53 blows for 3 inches
						Bulk sample from 15 to 20 feet
20					▲	
25		... fine to coarse grained.			>> ■	N = 60 blows for 6 inches
30		... silty.			▲	
35						

GEOBASE, INC.

PROJECT	**Lake Forest Medical Office Building, Lake Forest, California**		**BORING NO. B-3**
DEPTH TO WATER feet ▼	SURFACE ELEV. **775 feet**	LOGGED BY **RAP**	PROJECT NO. **C.314.06.00**
DEPTH TO SLOUGH ▲	DRILL RIG **CME-75** DRILLER **WESTHAZMAT**	DATE LOGGED **02/19/2003**	FIGURE NO. **B-4**

Note: This log of boring should be evaluated in conjunction with the complete geotechnical report. This log of boring represents conditions observed at the specific boring location and at the date indicated.

LOG OF BORING

SAMPLE TYPE: THIN WALLED TUBE | SPT SPLIT SPOON | CALIFORNIA MODIFIED SAMPLER | DISTURBED | NO RECOVERY | CORE

DEPTH (feet)	GRAPHIC LOG	SOIL DESCRIPTION	SOIL CLASSIFICATION	SAMPLE	DRY DENSITY (PCF) 80 90 100 110 120; Water Content (%): ●; Plastic Limit (W_P) — Liquid Limit (W_L); Penetration, blows/foot: ■ 10 20 30 40 50	REMARKS/ OTHER TESTS
		SANDSTONE (BEDROCK), white, silty, fine to coarse grained, friable, cemented, very dense, moist.	Ss		>> ■	N = 61 blows for 6 inches
40					▲	
45					>> ■	N = 69 blows for 5 inches
50					▲	
55		* End of boring at 53.0 feet. * Auger refusal at 53.0 feet. * Boring dry at completion of drilling.				
60						
65						
70						

GEOBASE, INC.

PROJECT	Lake Forest Medical Office Building Lake Forest, California			BORING NO. B-3
DEPTH TO WATER feet ▼	SURFACE ELEV. 775 feet		LOGGED BY RAP	PROJECT NO. C.314.06.00
DEPTH TO SLOUGH ▲	DRILL RIG CME-75 DRILLER WESTHAZMAT		DATE LOGGED 02/19/2003	FIGURE NO. B-4

Note: This log of boring should be evaluated in conjunction with the complete geotechnical report. This log of boring represents conditions observed at the specific boring location and at the date indicated.

LOG OF BORING

SAMPLE TYPE: ■ THIN WALLED TUBE ◫ SPT SPLIT SPOON ☒ CALIFORNIA MODIFIED SAMPLER ▤ DISTURBED ◥ NO RECOVERY ▦ CORE

DEPTH (feet)	GRAPHIC LOG	SOIL DESCRIPTION	SOIL CLASSIFICATION	SAMPLE	DRY DENSITY (PCF) 80 90 100 110 120; Water Content (%): ●; Plastic Limit (W_P) ⊢—⊣ Liquid Limit (W_L); Penetration, blows/foot: ■ 10 20 30 40 50	REMARKS/ OTHER TESTS
		SAND (FILL), white, some silt, moist.	SM			
		SANDSTONE (BEDROCK), white, some silt, massive, friable, moist.	Ss			Bulk sample from 0 to 5 feet pH, Ch, ER, SO_4
5		... fine to coarse grained , very dense.			>> ■	N = 85 blows for 8 inches
						Bulk sample from 5 to 10 feet
10						
						Bulk sample from 10 to 15 feet
15		... little silt, very dense.			>> ■	N = 53 blows for 6 inches PS
						Bulk sample from 15 to 20 feet
20						
25		... fine to coarse grained, very dense.			>> ■	N = 63 blows for 6 inches
30		.. some silt, fine to coarse grained, damp.				
35						

GEOBASE, INC.

PROJECT	**Lake Forest Medical Office Building Lake Forest, California**			**BORING NO. B-4**
DEPTH TO WATER feet ▼	SURFACE ELEV. **775 feet**		LOGGED BY **RAP**	PROJECT NO. **C.314.06.00**
DEPTH TO SLOUGH ▲	DRILL RIG **CME-75** DRILLER **WESTHAZMAT**		DATE LOGGED **02/20/2003**	FIGURE NO. **B-5**

Note: This log of boring should be evaluated in conjunction with the complete geotechnical report. This log of boring represents conditions observed at the specific boring location and at the date indicated.

LOG OF BORING

SAMPLE TYPE: THIN WALLED TUBE | SPT SPLIT SPOON | CALIFORNIA MODIFIED SAMPLER | DISTURBED | NO RECOVERY | CORE

DEPTH (feet)	GRAPHIC LOG	SOIL DESCRIPTION	SOIL CLASSIFICATION	SAMPLE	DRY DENSITY (PCF) 80 90 100 110 120; Water Content (%): ●; Plastic Limit (W_P) — Liquid Limit (W_L); Penetration, blows/foot: ■ 10 20 30 40 50	REMARKS/ OTHER TESTS
		SANDSTONE (BEDROCK), white, some silt, fine to coarse grained, friable, cemented, very dense, damp.	Ss		>> ■	N = 50 blows for 3 inches
40		... fine to medium grained, moist.			▲	
45		... very dense.			>> ■	N = 50 blows for 4 inches
50		* End of boring at 48.0 feet. * Auger refusal at 48.0 feet. * Boring dry at completion of drilling.				
55						
60						
65						
70						

GEOBASE, INC.

PROJECT	**Lake Forest Medical Office Building Lake Forest, California**		BORING NO. **B-4**
DEPTH TO WATER ▼ feet	SURFACE ELEV. **775 feet**	LOGGED BY **RAP**	PROJECT NO. **C.314.06.00**
DEPTH TO SLOUGH ▲	DRILL RIG **CME-75** DRILLER **WESTHAZMAT**	DATE LOGGED **02/20/2003**	FIGURE NO. **B-5**

Note: This log of boring should be evaluated in conjunction with the complete geotechnical report. This log of boring represents conditions observed at the specific boring location and at the date indicated.

LOG OF BORING

SAMPLE TYPE: THIN WALLED TUBE | SPT SPLIT SPOON | CALIFORNIA MODIFIED SAMPLER | DISTURBED | NO RECOVERY | CORE

DRY DENSITY (PCF): 80 90 100 110 120

Water Content (%): ●

Plastic Limit (W_P) ⊢—⊣ Liquid Limit (W_L)

Penetration, blows/foot: ■ 10 20 30 40 50

DEPTH (feet)	SOIL DESCRIPTION	SOIL CLASSIFICATION	REMARKS/ OTHER TESTS
0	SAND (FILL), light grey, some silt, moist.	SM	Bulk sample from 0 to 5 feet EI, RV
5	... medium dense.		Bulk sample from 5 to 10 feet
10	SAND (FILL), brown, some clay, medium to coarse grained. moist.	SC	PS, C, DS
			Bulk sample from 10 to 15 feet
15	... interbedded with white sand with some clay, medium dense, moist.		PS
			Bulk sample from 15 to 20 feet
20			PS, C
25	...medium dense.		
	SANDSTONE (BEDROCK), white, silty, massive,friable, moist.	Ss	
30			
35			

GEOBASE, INC.

PROJECT	**Lake Forest Medical Office Building, Lake Forest, California**		BORING NO. **B-5**
DEPTH TO WATER feet ▼	SURFACE ELEV. **775 feet**	LOGGED BY **RAP**	PROJECT NO. **C.314.06.00**
DEPTH TO SLOUGH ▼	DRILL RIG **CME-75** DRILLER **CASCADE**	DATE LOGGED **02/19/2003**	FIGURE NO. **B-6**

Note: This log of boring should be evaluated in conjunction with the complete geotechnical report. This log of boring represents conditions observed at the specific boring location and at the date indicated.

LOG OF BORING

SAMPLE TYPE: THIN WALLED TUBE | SPT SPLIT SPOON | CALIFORNIA MODIFIED SAMPLER | DISTURBED | NO RECOVERY | CORE

DEPTH (feet)	GRAPHIC LOG	SOIL DESCRIPTION	SOIL CLASSIFICATION	SAMPLE	DRY DENSITY (PCF) 80 90 100 110 120; Water Content (%): ●; Plastic Limit (W_P) — Liquid Limit (W_L); Penetration, blows/foot: ■ 10 20 30 40 50	REMARKS/ OTHER TESTS
		SANDSTONE (BEDROCK), white, silty, fine to coarse grained, massive, friable, very dense, moist.	Ss			>> ■ N = 55 blows for 6 inches
40						
45						>> ■ N = 54 blows for 4 inches
50						
55						>> ■ N = 50 blows for 3 inches
60						
65						>> ■ N = 50 blows for 2 inches
70						

GEOBASE, INC.

PROJECT	**Lake Forest Medical Office Building, Lake Forest, California**			BORING NO. **B-5**
DEPTH TO WATER feet ▼	SURFACE ELEV. **775 feet**		LOGGED BY **RAP**	PROJECT NO. **C.314.06.00**
DEPTH TO SLOUGH ▼	DRILL RIG **CME-75** DRILLER **CASCADE**		DATE LOGGED **02/19/2003**	FIGURE NO. **B-6**

Note: This log of boring should be evaluated in conjunction with the complete geotechnical report. This log of boring represents conditions observed at the specific boring location and at the date indicated.

LOG OF BORING

SAMPLE TYPE: THIN WALLED TUBE | SPT SPLIT SPOON | CALIFORNIA MODIFIED SAMPLER | DISTURBED | NO RECOVERY | CORE

DEPTH (feet)	GRAPHIC LOG	SOIL DESCRIPTION	SOIL CLASSIFICATION	SAMPLE	DRY DENSITY (PCF) 80 90 100 110 120; Water Content (%): ●; Plastic Limit (W_P) — Liquid Limit (W_L); Penetration, blows/foot: ■ 10 20 30 40 50	REMARKS/ OTHER TESTS
		* End of boring at 69.4 feet. * Boring dry at completion of drilling.				
75						
80						
85						
90						
95						
100						
105						

GEOBASE, INC.

PROJECT: **Lake Forest Medical Office Building, Lake Forest, California**

DEPTH TO WATER feet ▼

DEPTH TO SLOUGH ▼

SURFACE ELEV. **775 feet**

DRILL RIG **CME-75**

DRILLER **CASCADE**

LOGGED BY **RAP**

DATE LOGGED **02/19/2003**

BORING NO. **B-5**

PROJECT NO. **C.314.06.00**

FIGURE NO. **B-6**

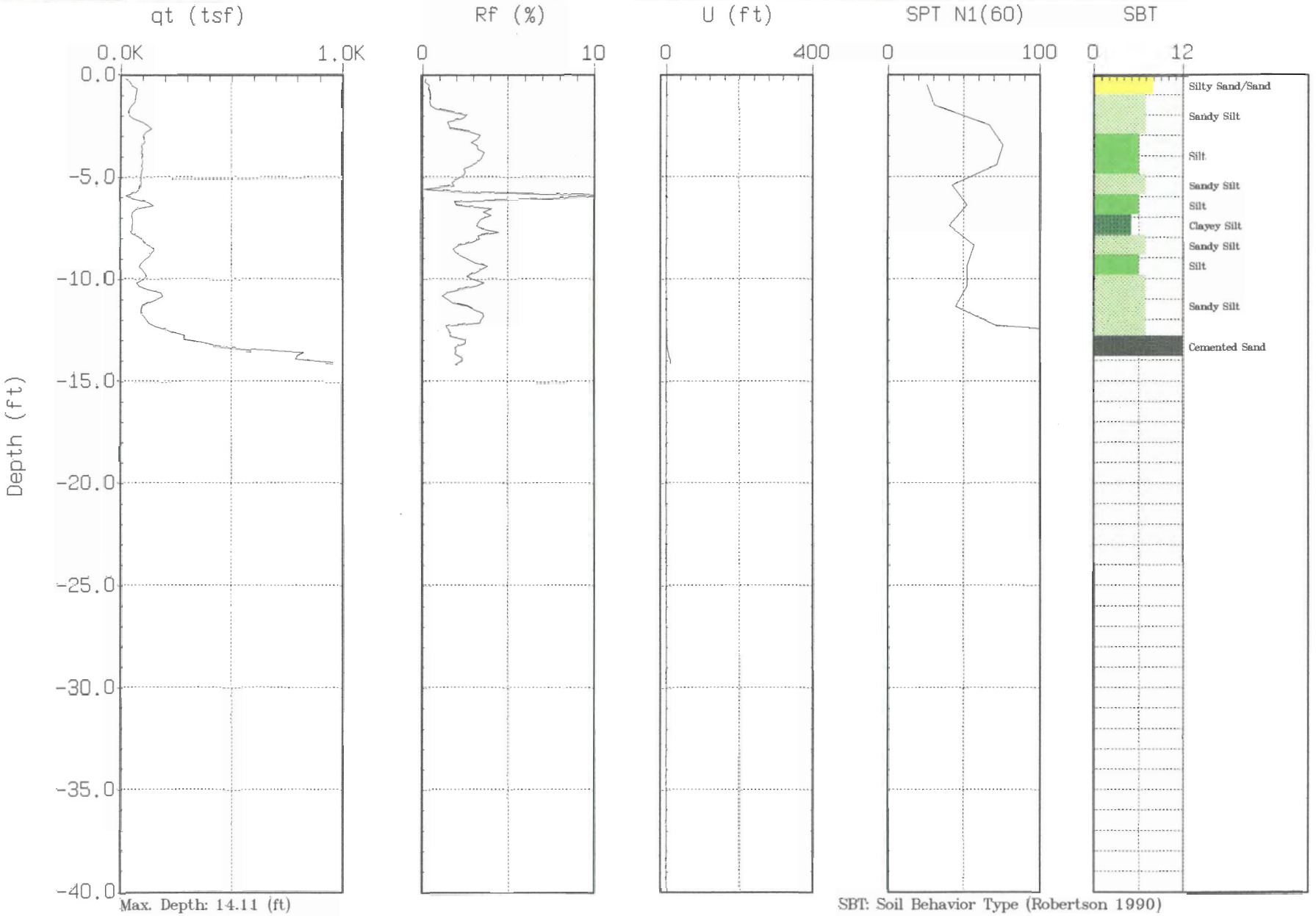
Note: This log of boring should be evaluated in conjunction with the complete geotechnical report. This log of boring represents conditions observed at the specific boring location and at the date indicated.

GREGG

GEOBASE

Site : LAKE FOREST MOB
Location : CPT-01

Engineer : B. PEARSON
Date : 02:20:03 13:10



Max. Depth: 14.11 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

Figure B-7

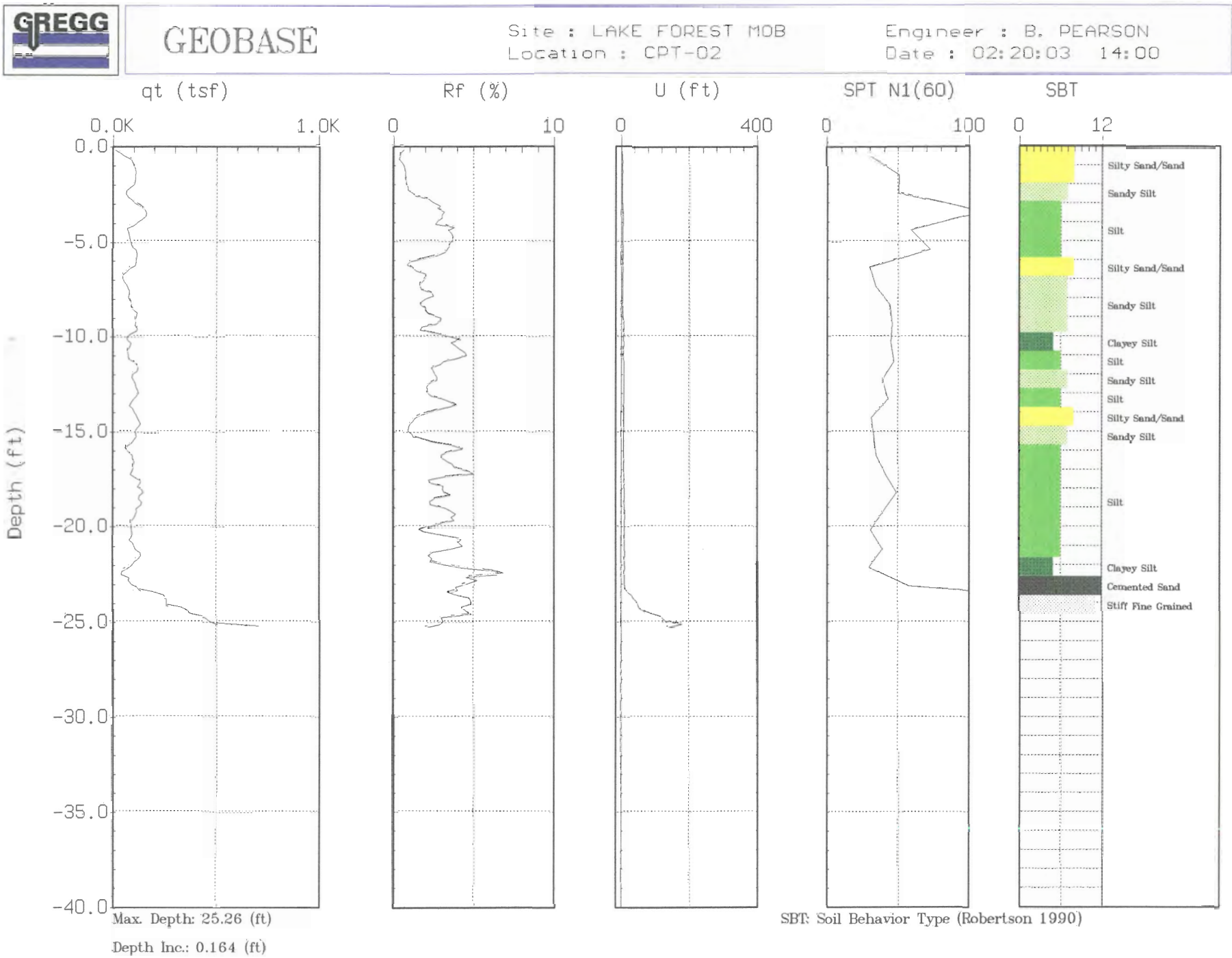

GREGG
GEOBASE
Site : LAKE FOREST MOB
Location : CPT-02
Engineer : B. PEARSON
Date : 02:20:03 14:00
qt (tsf)
0.0K
1.0K
Rf (%)
0
10
U (ft)
0
400
SPT N1(60)
0
100
SBT
0
12
Depth (ft)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
Silty Sand/Sand
Sandy Silt
Silt
Silty Sand/Sand
Sandy Silt
Clayey Silt
Silt
Sandy Silt
Silt
Silty Sand/Sand
Sandy Silt
Silt
Clayey Silt
Cemented Sand
Stiff Fine Grained
Max. Depth: 25.26 (ft)
Depth Inc.: 0.164 (ft)
SBT: Soil Behavior Type (Robertson 1990)

Figure B-8

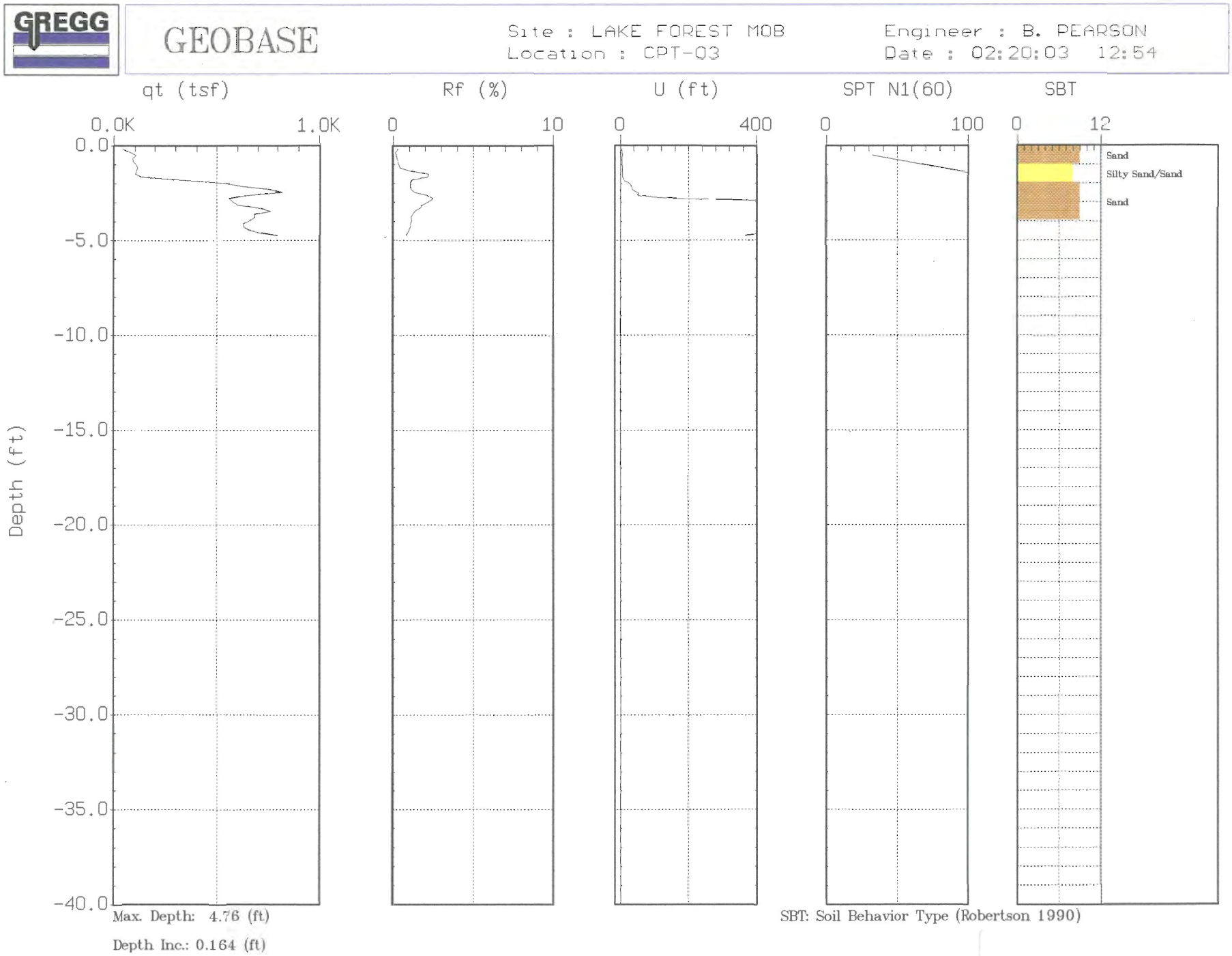

GREGG
GEOBASE
Site : LAKE FOREST MOB
Location : CPT-03
Engineer : B. PEARSON
Date : 02:20:03 12:54
qt (tsf)
Rf (%)
U (ft)
SPT N1(60)
SBT
0.0K
1.0K
0
10
0
400
0
100
0
12
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
Depth (ft)
Sand
Silty Sand/Sand
Sand
Max. Depth: 4.76 (ft)
Depth Inc.: 0.164 (ft)
SBT: Soil Behavior Type (Robertson 1990)

Figure B-9

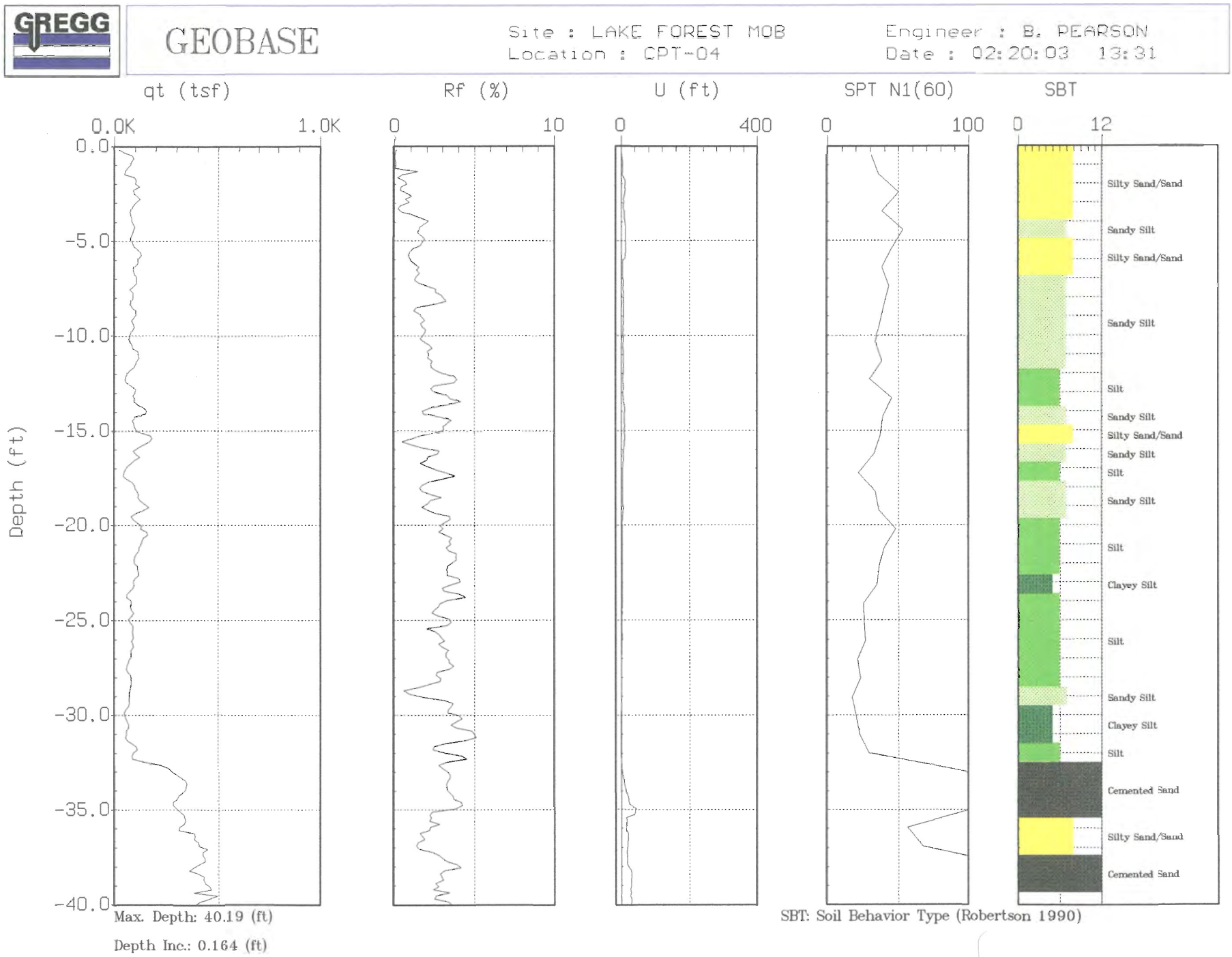

GREGG
GEOBASE
Site : LAKE FOREST MOB
Location : CPT-04
Engineer : B. PEARSON
Date : 02:20:03 13:31
qt (tsf)
0.0K
1.0K
Rf (%)
0
10
U (ft)
0
400
SPT N1(60)
0
100
SBT
0
12
Depth (ft)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
Silty Sand/Sand
Sandy Silt
Silty Sand/Sand
Sandy Silt
Silt
Sandy Silt
Silty Sand/Sand
Sandy Silt
Silt
Sandy Silt
Silt
Clayey Silt
Silt
Sandy Silt
Clayey Silt
Silt
Cemented Sand
Silty Sand/Sand
Cemented Sand
Max. Depth: 40.19 (ft)
Depth Inc.: 0.164 (ft)
SBT: Soil Behavior Type (Robertson 1990)

Figure B-10

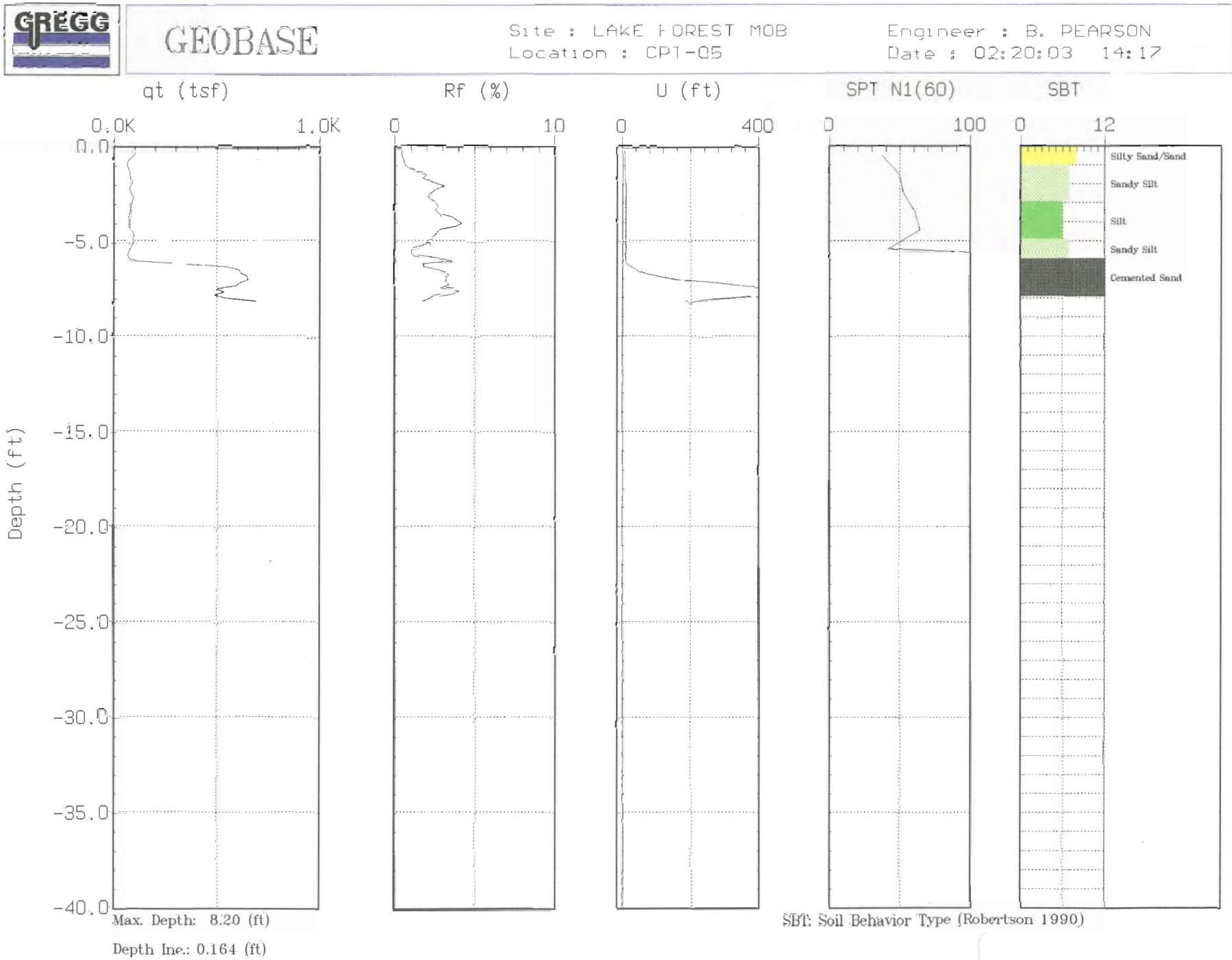

GREGG
GEOBASE
Site : LAKE FOREST MOB
Location : CPT-05
Engineer : B. PEARSON
Date : 02:20:03 14:17
qt (tsf)
0.0K
1.0K
Rf (%)
0
10
U (ft)
0
400
SPT N1(60)
0
100
SBT
0
12
Silty Sand/Sand
Sandy Silt
Silt
Sandy Silt
Cemented Sand
Depth (ft)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
Max. Depth: 8.20 (ft)
Depth Inc.: 0.164 (ft)
SBT: Soil Behavior Type (Robertson 1990)

Figure B-11

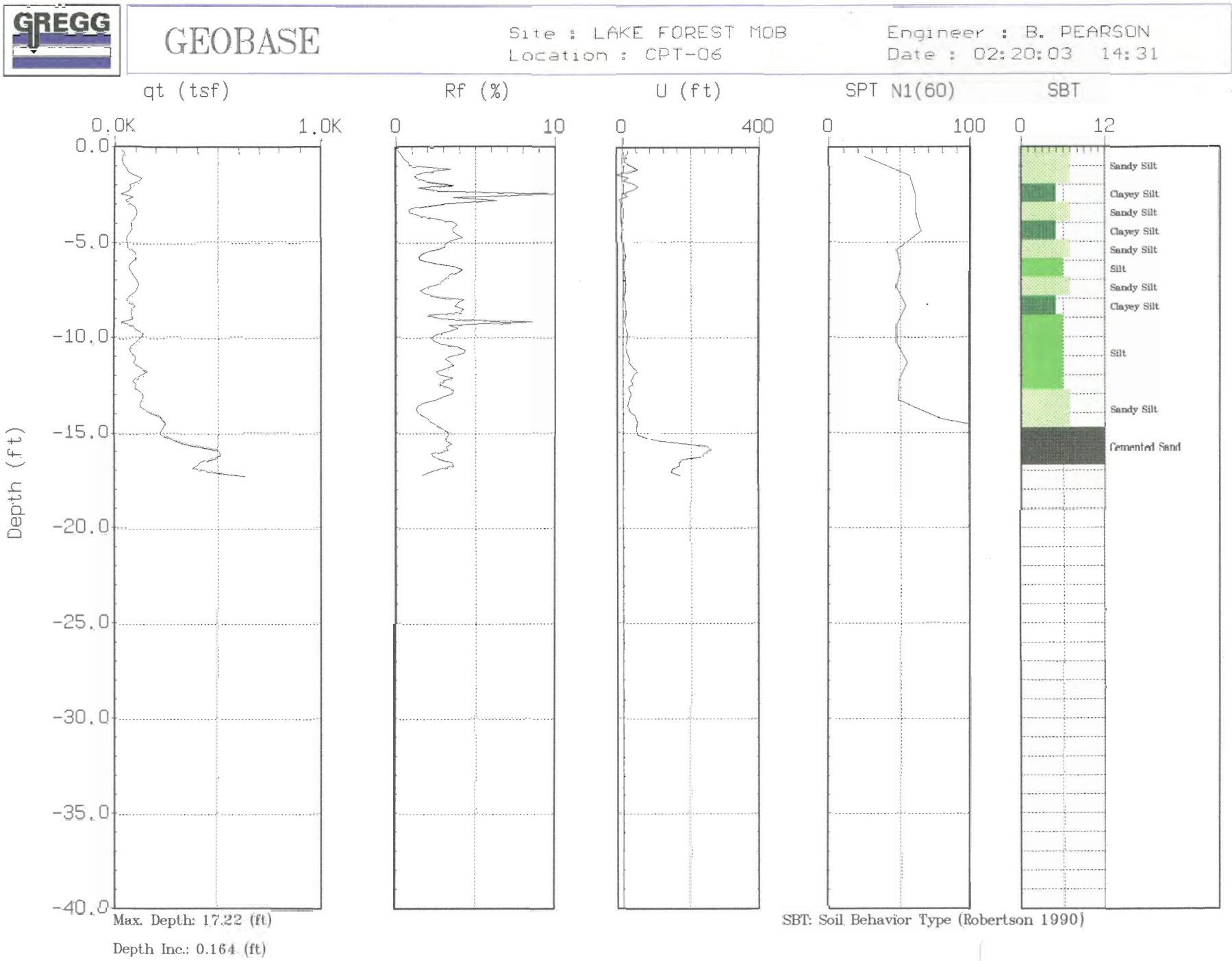

GREGG
GEOBASE
Site : LAKE FOREST MOB
Location : CPT-06
Engineer : B. PEARSON
Date : 02:20:03 14:31
qt (tsf)
0.0K
1.0K
Rf (%)
0
10
U (ft)
0
400
SPT N1(60)
0
100
SBT
0
12
Depth (ft)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
Sandy Silt
Clayey Silt
Sandy Silt
Clayey Silt
Sandy Silt
Silt
Sandy Silt
Clayey Silt
Silt
Sandy Silt
Cemented Sand
Max. Depth: 17.22 (ft)
Depth Inc.: 0.164 (ft)
SBT: Soil Behavior Type (Robertson 1990)

Figure B-12

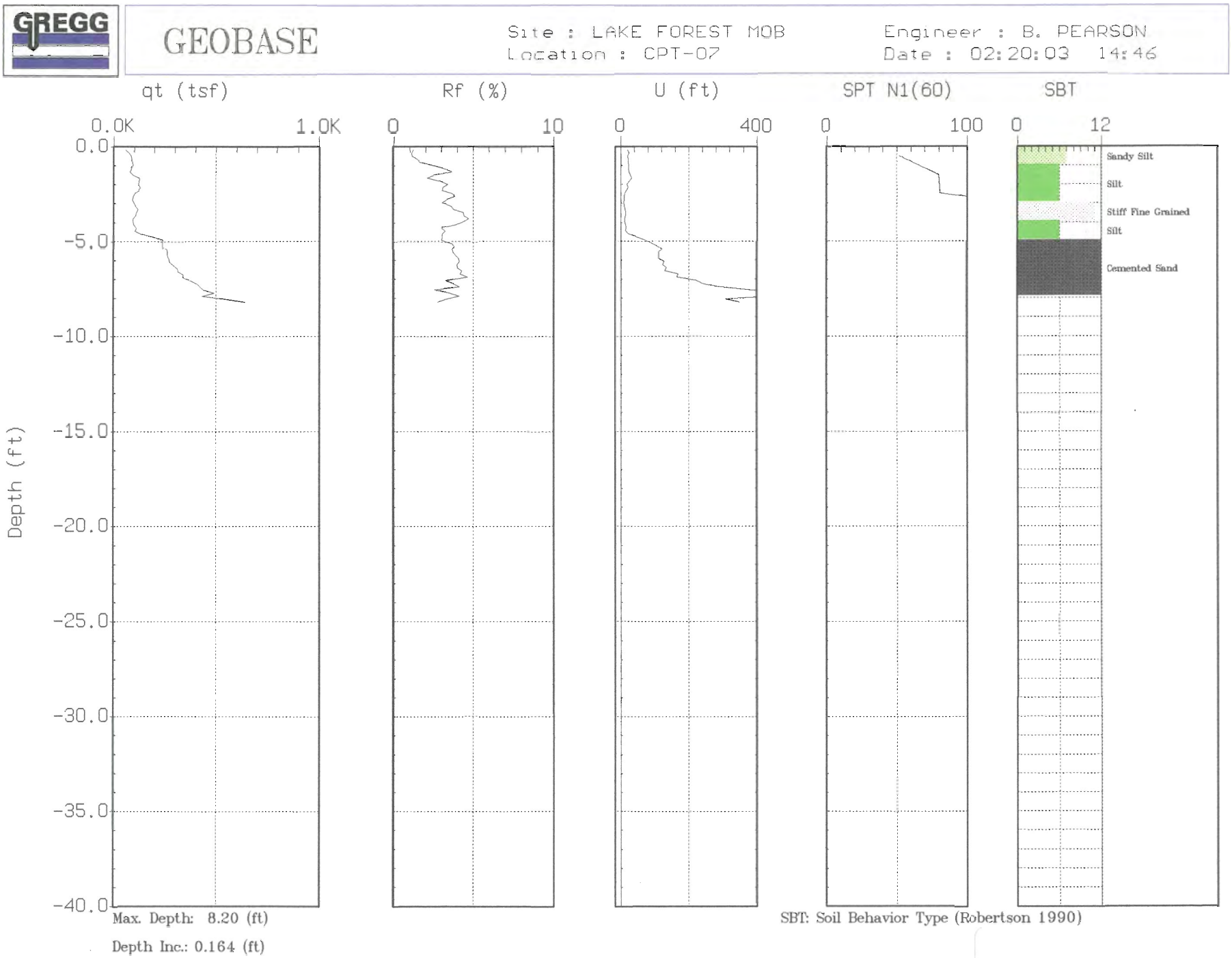

GREGG
GEOBASE
Site : LAKE FOREST MOB
Location : CPT-07
Engineer : B. PEARSON
Date : 02:20:03 14:46
qt (tsf)
0.0K
1.0K
Rf (%)
0
10
U (ft)
0
400
SPT N1(60)
0
100
SBT
0
12
Depth (ft)
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
-35.0
-40.0
Sandy Silt
Silt
Stiff Fine Grained
Silt
Cemented Sand
Max. Depth: 8.20 (ft)
Depth Inc.: 0.164 (ft)
SBT: Soil Behavior Type (Robertson 1990)

Figure B-13

GEOTECHNICAL BORING LOG

PROJECT NO.	500353	PROJECT NAME	FOOTHILL RANCH		
DATE STARTED	11/28/95	GROUND ELEV.	776.0	BORING DESIG.	SB- 4
DATE FINISHED	11/30/95	GW DEPTH (FT)		LOGGED BY	SNK
DRILLER	Alroy Drilling	DRIVE WT.	varies		
TYPE OF DRILL RIG	18" bucket	DROP	12 inch		

DEPTH (Feet)	ELEV	SAMPLE TYPE	SAMPLE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	775			2400#			**FILL (Qaf)** CLAYEY SAND, medium brown and olive brown and light brown, fine to coarse grained , with fine gravel, moist, with some white sand, with occasional cobbles				
5		D		8			grades dark brown	10.5	119	68	
	770						becomes SANDY CLAY, dark brown, with white clayey sand, moist				
10		D		3				15.4	112	82	
	765			3350#			grades with more white sand bedrock fragments within white sand				
15		D		5				10.6	119	70	
	760										
20		D		7				10.6	122	75	
	755						SILTY SAND, olive brown, fine to coarse grained, with mica, and dark brown, CLAYEY SAND / SANDY CLAY				
25		D		5				12.6	120	83	
	750			2045#							
30		D		6			SANDY CLAY, dark brown, fine to coarse grained, some roots	10.0	122	71	
	745						**ALLUVIUM (Qal)**				
35		D		5		SC	SANDY CLAY / CLAYEY SAND, medium brown, fine to coarse grained, with some fine to coarse gravel, damp to moist	12.2	116	73	CON
	740						SAND, light brown, fine to coarse grained, with some silt and fine gravel, moist				
40		D		5		SC	with some very plastic, brown clay	15.4	107	73	CON
	735										
45		D		3		ML	CLAYEY SILT, light gray, moist, with some sand	18.5	95	65	CON
	730										

SAMPLE TYPES:
- [D] DRIVE (RING) SAMPLE
- [S] SPT (SPLIT SPOON) SAMPLE
- [B] BULK SAMPLE [T] TUBE SAMPLE

▼ GROUNDWATER

PACIFIC SOILS ENGINEERING, INC.

PLATE A-4

Figure B-14

GEOTECHNICAL BORING LOG

PROJECT NO.	500353	PROJECT NAME	FOOTHILL RANCH		
DATE STARTED	11/28/95	GROUND ELEV.	776.0	BORING DESIG.	SB- 4
DATE FINISHED	11/30/95	GW DEPTH (FT)		LOGGED BY	SNK
DRILLER	Alroy Drilling	DRIVE WT.	varies		
TYPE OF DRILL RIG	18" bucket	DROP	12 inch		

DEPTH (Feet)	ELEV	SAMPLE TYPE	SAMPLE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	725	D		7		ML	CLAYEY SILT, light gray, moist to wet	23.7	96	84	CON
							CLAYEY SAND, brown, fine to coarse grained, moist to wet				
55	720	D		3		SC		16.0	113	89	CON
				1200#			CLAYEY SAND, black brown, fine to coarse grained, wet, rust colored staining				
60	715	D		9		SC		14.9	117	90	CON
							SAND, medium brown, with some clay, moist				
65	710	D		15		SC	with some white sand	13.6	117	84	CON
70	705						CAPISTRANO FORMATION, OSO MEMBER (Tco) SANDSTONE, white, fine to coarse grained, moist, with black specs TOTAL DEPTH 71 FEET NO GROUNDWATER ENCOUNTERED NO CAVING OBSERVED				

SAMPLE TYPES:
- D DRIVE (RING) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

▼ GROUNDWATER

PACIFIC SOILS ENGINEERING, INC.

PLATE A-4

Figure B-14

GEOTECHNICAL BORING LOG

PROJECT NO.	500353	PROJECT NAME	FOOTHILL RANCH		
DATE STARTED	11/30/95	GROUND ELEV.	770.0	BORING DESIG.	SB- 8
DATE FINISHED	11/30/95	GW DEPTH (FT)	45.00	LOGGED BY	SNK
DRILLER	Alroy Drilling	DRIVE WT.	varies		
TYPE OF DRILL RIG	18" bucket auger	DROP	12 inch		

DEPTH (Feet)	ELEV	SAMPLE TYPE	SAMPLE	BLOWS/FT	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	770						**FILL (Qaf)** CLAYEY SAND, brown, fine to coarse grained, moist, with some fine gravel				
				3350#							
5	765	D		2				10.1	119	66	
10	760	D		2			occasional white sand layers	11.2	115	65	
15	755	D		5			SANDY CLAY, dark brown	9.3	118	58	
							CLAYEY SAND, white				
20	750	D		3				10.3	117	63	
25	745	D		2			SANDY CLAY, dark brown and medium brown, fine to coarse grained, moist	12.8	117	79	
				2045#			**ALLUVIUM (Qal)**				
30	740	D		3		SC	SANDY CLAY, medium brown, fine to coarse grained, moist, slightly plastic	15.9	109	78	CON
							SAND, light brown, fine to coarse grained, with fine gravel, moist				
35	735	D		4		ML	CLAYEY SILT, medium brown, with a trace of fine sand and mica, plastic	23.6	99	91	CON
40	730	D		4		ML		23.8	99	92	CON
							SAND, light brown, fine to coarse grained, with fine gravel, moist to wet				
45	725	D		8		SP	▼ wet	17.1	107	81	CON
							TOTAL DEPTH 46 FEET GROUNDWATER AT 45 FEET CAVING 44 1/2 TO 46 FEET				

SAMPLE TYPES:
- [D] DRIVE (RING) SAMPLE
- [S] SPT (SPLIT SPOON) SAMPLE
- [B] BULK SAMPLE
- [T] TUBE SAMPLE

▼ GROUNDWATER

PACIFIC SOILS ENGINEERING, INC.

PLATE A-8

Figure B-15

LOG OF BORING

SAMPLE TYPE: ■ THIN WALLED TUBE ◫ SPT SPLIT SPOON ☒ CALIFORNIA MODIFIED SAMPLER ▤ DISTURBED ◥ NO RECOVERY ▦ CORE

DEPTH (feet)	GRAPHIC LOG	SOIL DESCRIPTION	SOIL CLASSIFICATION	SAMPLE	DRY DENSITY (PCF) 80 90 100 110 120; Water Content (%): ●; Plastic Limit (W_P) — Liquid Limit (W_L); Penetration, blows/foot: ■ 10 20 30 40 50	REMARKS/ OTHER TESTS
		SAND (FILL), light whitish to gray, silty, slightly moist, some coble sizes	SM			
5						
		...light brown, very moist, trace of clay.				
10		...dark brown, lilltle clay, very moist, organic ordor.				5 blows for 12 in
		...light grayish, silty sand				
15						
		...light brown, moist				
20						6 blows for 12 in
25						
30						
35						

GEOBASE, INC.

PROJECT	**Kaiser Permanente Foothill Ranch MOB, Lake Forest, California**			**BORING NO. BA-1**
DEPTH TO WATER ▼ feet	SURFACE ELEV. **776.0 feet**		LOGGED BY **SG**	PROJECT NO. **C.314.41.00**
DEPTH TO SLOUGH ▲	DRILL RIG **EARTHDRILL** DRILLER **ALROY**		DATE LOGGED **05/20/2011**	FIGURE NO. B-**16**

Note: This log of bucket auger should be evaluated in conjunction with the complete geotechnical report. This log of bucket auger represents conditions observed at the specific bucket auger location and at the date indicated.

LOG OF BORING

SAMPLE TYPE: ■ THIN WALLED TUBE ◫ SPT SPLIT SPOON ☒ CALIFORNIA MODIFIED SAMPLER ▤ DISTURBED ◥ NO RECOVERY ▦ CORE

DEPTH (feet)	GRAPHIC LOG	SOIL DESCRIPTION	SOIL CLASSIFICATION	SAMPLE	DRY DENSITY (PCF) 80 90 100 110 120; Water Content (%): ●; Plastic Limit (W_P) — Liquid Limit (W_L); Penetration, blows/foot: ■ 10 20 30 40 50	REMARKS/ OTHER TESTS
40		SAND (FILL), light to grayish brown, silty, moist.	SM			
		...light brown, trace of cobles size				8 blows for 12 in
45		SANDSTONE (BEDROCK), light to grayish brown, horizontal contact.	SS			
50		..whitish, unoxidize sandstone, moist.				50 blows for 6 in
55		End of Boring at 54.0 feet Boring dry at completion of drilling Hammer - 2400lb (0-24ft) 1500lb (24-43ft) 850lb (43-54ft)				
60						
65						
70						

GEOBASE, INC.

PROJECT: **Kaiser Permanente**
Foothill Ranch MOB, Lake Forest, California

BORING NO. BA-1

DEPTH TO WATER feet ▼ | SURFACE ELEV. **776.0 feet** | LOGGED BY **SG** | PROJECT NO. **C.314.41.00**

DEPTH TO SLOUGH ▲ | DRILL RIG **EARTHDRILL** DRILLER **ALROY** | DATE LOGGED **05/20/2011** | FIGURE NO. B-**16**

Note: This log of bucket auger should be evaluated in conjunction with the complete geotechnical report. This log of bucket auger represents conditions observed at the specific bucket auger location and at the date indicated.

LOG OF BORING

SAMPLE TYPE: ■ THIN WALLED TUBE ◫ SPT SPLIT SPOON ☒ CALIFORNIA MODIFIED SAMPLER ▤ DISTURBED ◥ NO RECOVERY ▦ CORE

DEPTH (feet)	GRAPHIC LOG	SOIL DESCRIPTION	SOIL CLASSIFICATION	SAMPLE	DRY DENSITY (PCF) 80 90 100 110 120; Water Content (%): ●; Plastic Limit (W_P) — Liquid Limit (W_L); Penetration, blows/foot: ■ 10 20 30 40 50	REMARKS/ OTHER TESTS
		SAND (FILL), light brown, fine-grained, silty, slightly moist	SM			
		...light to grayish brown, sand-stone fragments				
5						
10		...light brown, very moist			▲	5 blows for 12 in
15		...dark grayish, silty.				
20		...light gray				
25						
30		...trace of clay				
35						

GEOBASE, INC.

PROJECT: **Kaiser Permanente**
Foothill Ranch MOB, Lake Forest, California

BORING NO. BA-2

DEPTH TO WATER feet ▼ | SURFACE ELEV. **776.0 feet** | LOGGED BY **SG** | PROJECT NO. **C.314.41.00**

DEPTH TO SLOUGH ▲ | DRILL RIG **EARTHDRILL** DRILLER **ALROY** | DATE LOGGED **05/20/2011** | FIGURE NO. B-**17**

Note: This log of bucket auger should be evaluated in conjunction with the complete geotechnical report. This log of bucket auger represents conditions observed at the specific bucket auger location and at the date indicated.

LOG OF BORING

SAMPLE TYPE: ■ THIN WALLED TUBE ◫ SPT SPLIT SPOON ☒ CALIFORNIA MODIFIED SAMPLER ▤ DISTURBED ◥ NO RECOVERY ▦ CORE

DEPTH (feet)	GRAPHIC LOG	SOIL DESCRIPTION	SOIL CLASSIFICATION	SAMPLE	DRY DENSITY (PCF) 80 90 100 110 120; Water Content (%): ●; Plastic Limit (W_P) — Liquid Limit (W_L); Penetration, blows/foot: ■ 10 20 30 40 50	REMARKS/ OTHER TESTS
		SAND (FILL), light to grayish brown, silty, moist.	SM			
40		SILTSTONE (BEDROCK), light to grayish brown, sandy, wearthered bedrock.	MS			
		SANDSTONE (BEDROCK), light to grayish brown, horizontal contact.	SS		▲	22 blows for 12in
45						
50		End of Boring at 46.0 feet Boring dry at completion of drilling Hammer - 2400lb (0-24ft) 1500lb (24-43ft) 850lb (43-54ft)				
55						
60						
65						
70						

GEOBASE, INC.

PROJECT	**Kaiser Permanente Foothill Ranch MOB, Lake Forest, California**			**BORING NO. BA-2**
DEPTH TO WATER ▼ feet	SURFACE ELEV. **776.0 feet**		LOGGED BY **SG**	PROJECT NO. **C.314.41.00**
DEPTH TO SLOUGH ▲	DRILL RIG **EARTHDRILL** DRILLER **ALROY**		DATE LOGGED **05/20/2011**	FIGURE NO. B-**17**

Note: This log of bucket auger should be evaluated in conjunction with the complete geotechnical report. This log of bucket auger represents conditions observed at the specific bucket auger location and at the date indicated.

LOG OF BORING

SAMPLE TYPE: ■ THIN WALLED TUBE ▯ SPT SPLIT SPOON ☒ CALIFORNIA MODIFIED SAMPLER ▤ DISTURBED ◥ NO RECOVERY ▦ CORE

DEPTH (feet)	GRAPHIC LOG	SOIL DESCRIPTION	SOIL CLASSIFICATION	SAMPLE	DRY DENSITY (PCF) 80 90 100 110 120; Water Content (%): ●; Plastic Limit (W_P) — Liquid Limit (W_L); Penetration, blows/foot: ■ 10 20 30 40 50	REMARKS/ OTHER TESTS
0		SAND (FILL), light brown, fine-grained, silty, slightly moist	SM			
		...light to grayish brown, sand-stone fragments				
5						
10		...light brown, very moist				
		...trace of clay				
15		...dark grayish, silty.				5 blows for 12 in
20		...light brown				
		SANDSTONE (BEDROCK), light to grayish brown, horizontal contact.	SS			
25						
						30 blows for 9 in
30		End of Boring at 29.0 feet Boring dry at completion of drilling. Hammer - 2400lb (0-24ft) 1500lb (24-43ft)				
35						

GEOBASE, INC.

PROJECT: **Kaiser Permanente**
Foothill Ranch MOB, Lake Forest, California

BORING NO. BA-3

DEPTH TO WATER feet ▼ | SURFACE ELEV. **777.0 feet** | LOGGED BY **SG** | PROJECT NO. **C.314.41.00**

DEPTH TO SLOUGH ▲ | DRILL RIG **EARTHDRILL** DRILLER **ALROY** | DATE LOGGED **05/20/2011** | FIGURE NO. B-**18**

Note: This log of bucket auger should be evaluated in conjunction with the complete geotechnical report. This log of bucket auger represents conditions observed at the specific bucket auger location and at the date indicated.

APPENDIX C

GEOBASE, March 2003

GEOBASE, May 2011

GEOBASE, INC.

Figure C - 1

SUMMARY OF LABORATORY TEST RESULTS

PROJECT: Lake Forest Medical Office Building, Lake Forest, California | **PROJECT NO:** C.314.06.00 | **DATE:** March, 2003

BORING	DEPTH (feet)	MOISTURE CONTENT (Percent)	DRY DENSITY (pcf)	ATTERBERG LIMITS			PARTICLE SIZE DISTRIBUTION				OTHER TESTS	DESCRIPTION AND REMARKS
				LL (%)	PL (%)	PI (%)	CLAY (%)	SILT (%)	SAND (%)	GRAVEL (%)		
B-1	0-5.0	--									EI, RV	Ss
	5.0-5.3	7									C (Remodeled to 95%)	Ss
	5.0-10.0	--										Ss
	10.0-10.3	8	111.6									Ss
	10.0-15.0	--										Ss
	15.0-15.3	9										Ss
	15.0-20.0	--										Ss
	20.0-20.5	7	101.3									Ss
	25.0-25.2	8										Ss
	30.0-30.2	9	111.7									Ss
	35.0-35.3	8										Ss
	40.0-40.5	8	110.1									Ss
B-2	0-5.0	--									pH, Ch, ER,SO_4	SC
	5.0-6.5	12					27		72	1		SC
	5.0-10.0	--										SC
	10.0-11.5	9	119.9									SC
	10.0-15.0	--										Ss
	15.0-16.0	9										Ss
	15.0-20.0	--										Ss
	20.0-20.7	11	114.1									Ss
	25.0-25.7	9										Ss
	30.0-30.5	9	107.9									Ss
	35.0-35.4	7										Ss
	40.0-40.3	8	107.6									Ss
	45.0-45.3	8										Ss
	50.0-50.3	8	113.1									Ss
	55.0-55.5	9										Ss
B-3	0-5.0	--										SC
	5.0-5.8	9										SC
	5.0-10.0	--										Ss
	10.0-10.5	7	121.6								C	Ss
	10.0-15.0	--										Ss

GEOBASE, INC.

Figure C - 1

SUMMARY OF LABORATORY TEST RESULTS

PROJECT: Lake Forest Medical Office Building, Lake Forest, California | **PROJECT NO:** C.314.06.00 | **DATE:** March, 2003

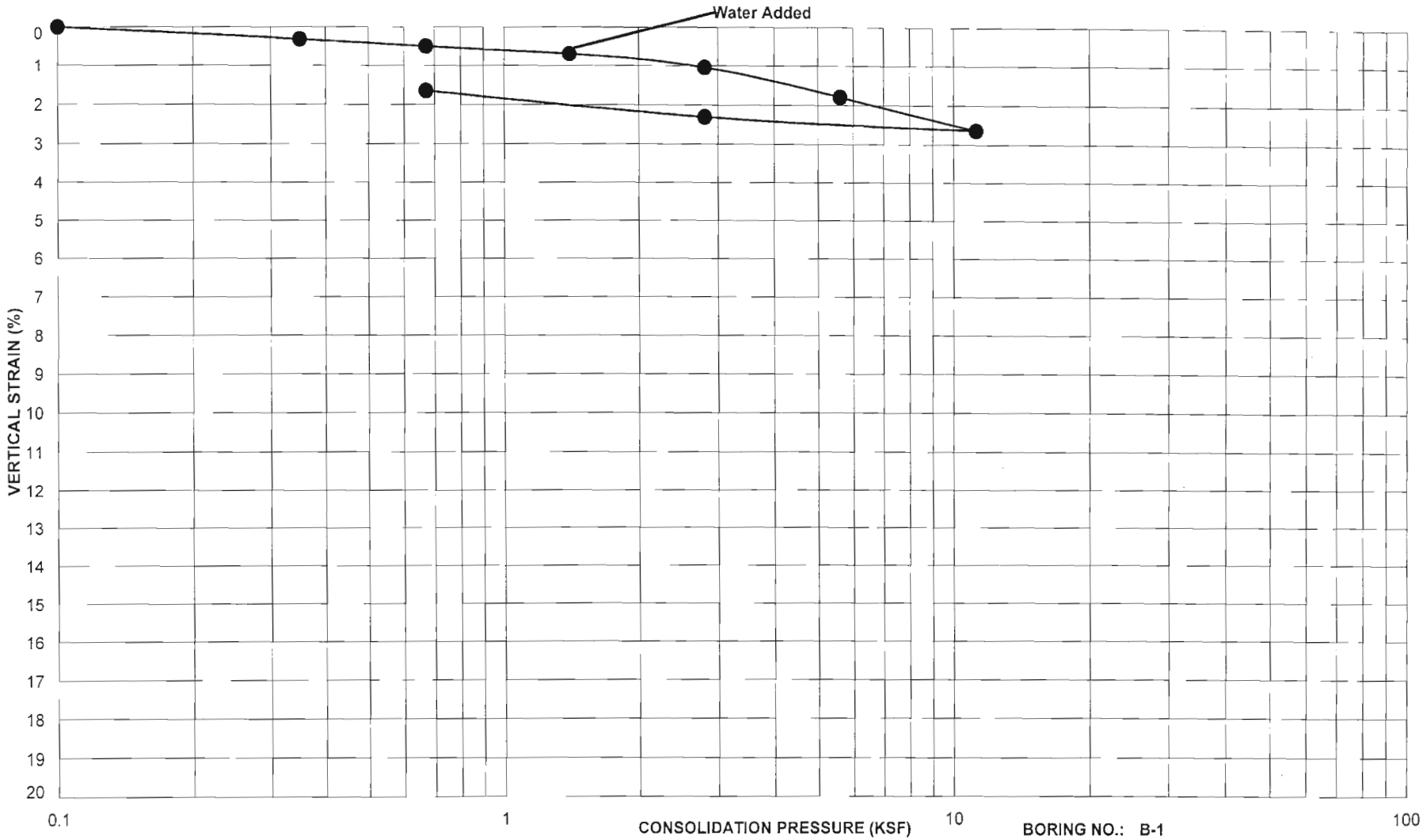
BORING	DEPTH (feet)	MOISTURE CONTENT (Percent)	DRY DENSITY (pcf)	ATTERBERG LIMITS			PARTICLE SIZE DISTRIBUTION				OTHER TESTS	DESCRIPTION AND REMARKS
				LL (%)	PL (%)	PI (%)	CLAY (%)	SILT (%)	SAND (%)	GRAVEL (%)		
B-3	15.0-15.2	5										Ss
	15.0-20.0	--										Ss
	20.0-20.3	8	100.2									Ss
	25.0-25.5	7										Ss
	30.0-30.5	7	106.1									Ss
	35.0-35.5	7										Ss
	40.0-40.4	10	106.7									Ss
	45.0-45.2	7										Ss
	50.0-50.4	7	108.8									Ss
B-4	0-5.0	--									pH, Ch, ER,SO_4	Ss
	5.0-6.2	8										Ss
	5.0-10.0	--										Ss
	10.0-10.3	6	105.7									Ss
	10.0-15.0	--										Ss
	15.0-15.5	8					13		87	0		Ss
	15.0-20.0	--										Ss
	20.0-20.5	8	106.6									Ss
	25.0-25.5	8										Ss
	30.0-30.2	3	110.6									Ss
	35.0-35.2	4										Ss
	40.0-40.2	7	95.3									Ss
	45.0-45.3	5										Ss
B-5	0-5.0	--									EI, RV	SC
	5-6.5	11										SC
	5.0-10.0	--										SC
	10.0-11.5	11	121.9				27		72	1	C, DS	SC
	10.0-15.0	--									C (Remodeled to 95%)	SC
	15.0-16.5	11					26		74	0		SC
	15.0-20.0	--									C (Remodeled to 95%)	SC
	20.0-21.5	10	116.7				29		71	0	C	SC
	25.0-26.5	9										SC
	30.0-30.5	9	102.3									Ss

GEOBASE, INC.

SUMMARY OF LABORATORY TEST RESULTS

PROJECT: Lake Forest Medical Office Building, Lake Forest, California | **PROJECT NO:** C.314.06.00 | **DATE:** March, 2003

BORING	DEPTH (feet)	MOISTURE CONTENT (Percent)	DRY DENSITY (pcf)	ATTERBERG LIMITS			PARTICLE SIZE DISTRIBUTION				OTHER TESTS	DESCRIPTION AND REMARKS
				LL (%)	PL (%)	PI (%)	CLAY (%)	SILT (%)	SAND (%)	GRAVEL (%)		
B-5	35.0-36.0	8										Ss
	40.0-40.5	8	105.1									Ss
	45.0-45.8	9										Ss
	50.0-50.5	12	105.7									Ss
	55.0-55.8	9										Ss
	60.0-60.3	10	110.7									Ss
	65.0-65.7	10										Ss
	69.0-69.3	9	101.1									Ss



BORING NO.: B-1

DEPTH (ft): 5.4 - 9.9

SAMPLE DESCRIPTION: SAND, white, some silt, fine to medium grained, very dense. Remolded to 95% relative compaction.

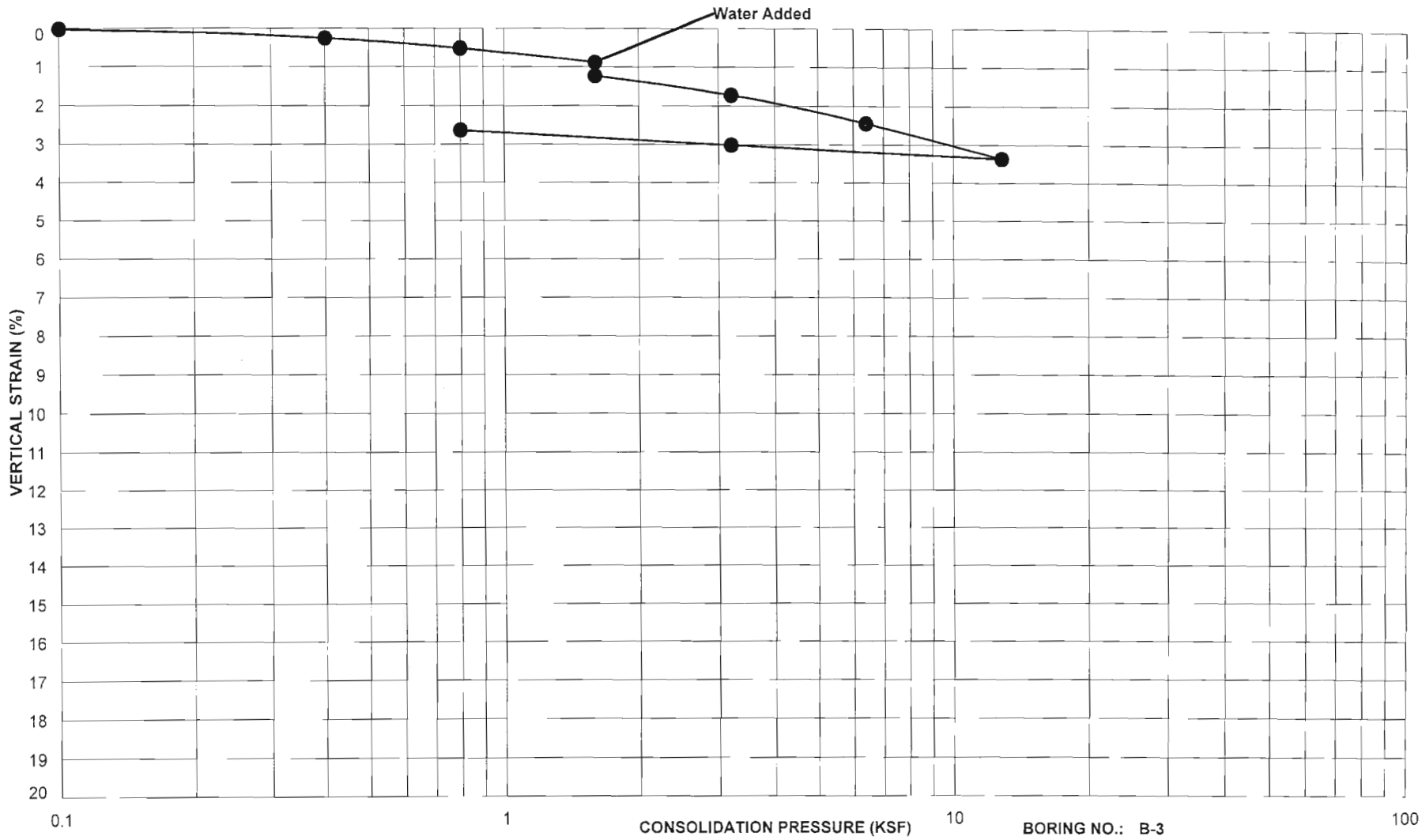
GEOBASE

Consolidation Test Results

Lake Forest Medical Office Building
Lake Forest, California

C.314.06.00

Figure C-2



BORING NO.: B-3

DEPTH (ft): 10.0 - 10.5

SAMPLE DESCRIPTION: SAND, white, some silt, very dense.

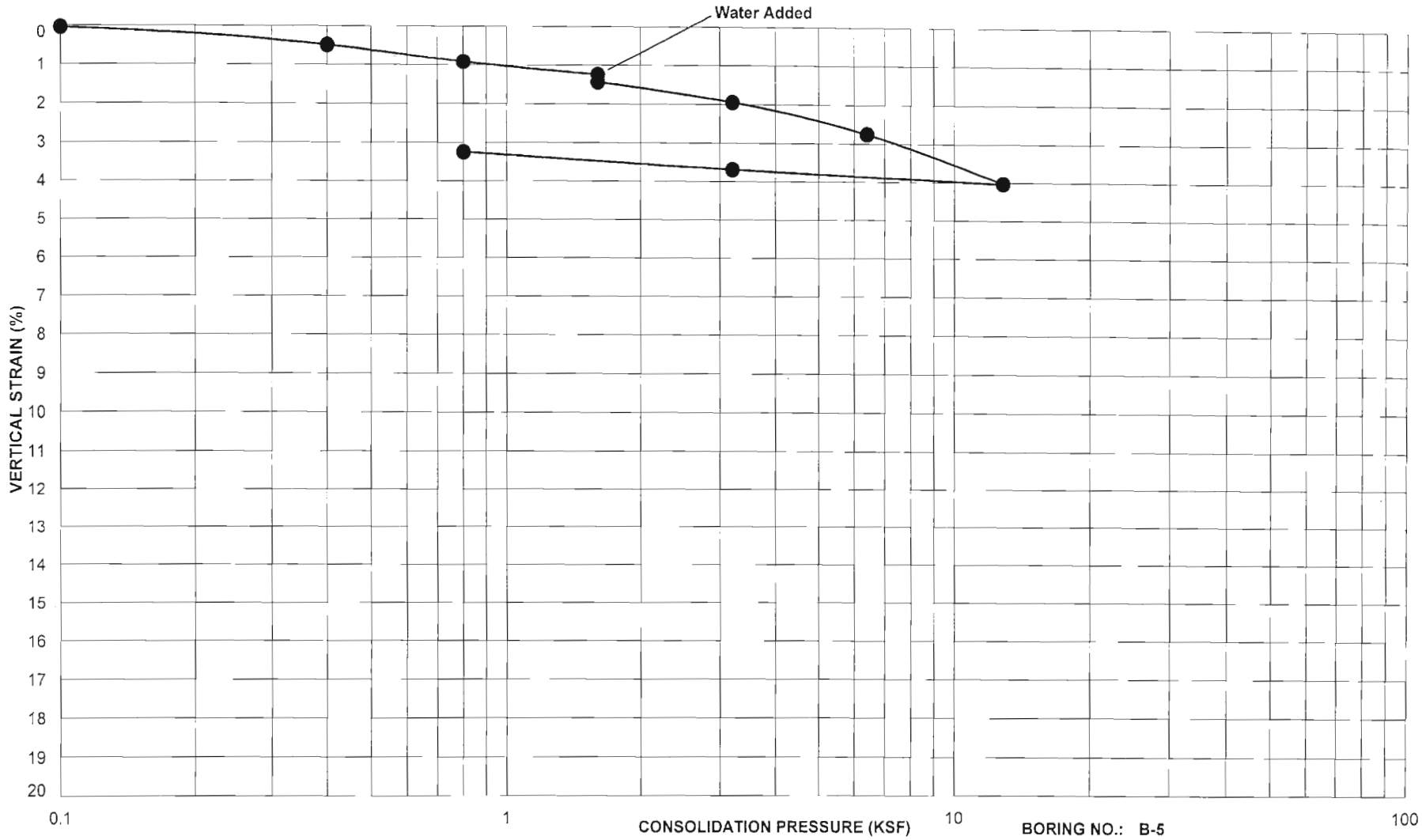
GEOBASE

Consolidation Test Results

Lake Forest Medical Office Building
Lake Forest, California

C.314.06.00

Figure C-3



BORING NO.: B-5

DEPTH (ft): 10.0 - 11.5

SAMPLE DESCRIPTION: SAND (Fill), brown, clayey, medium to coarse grained.

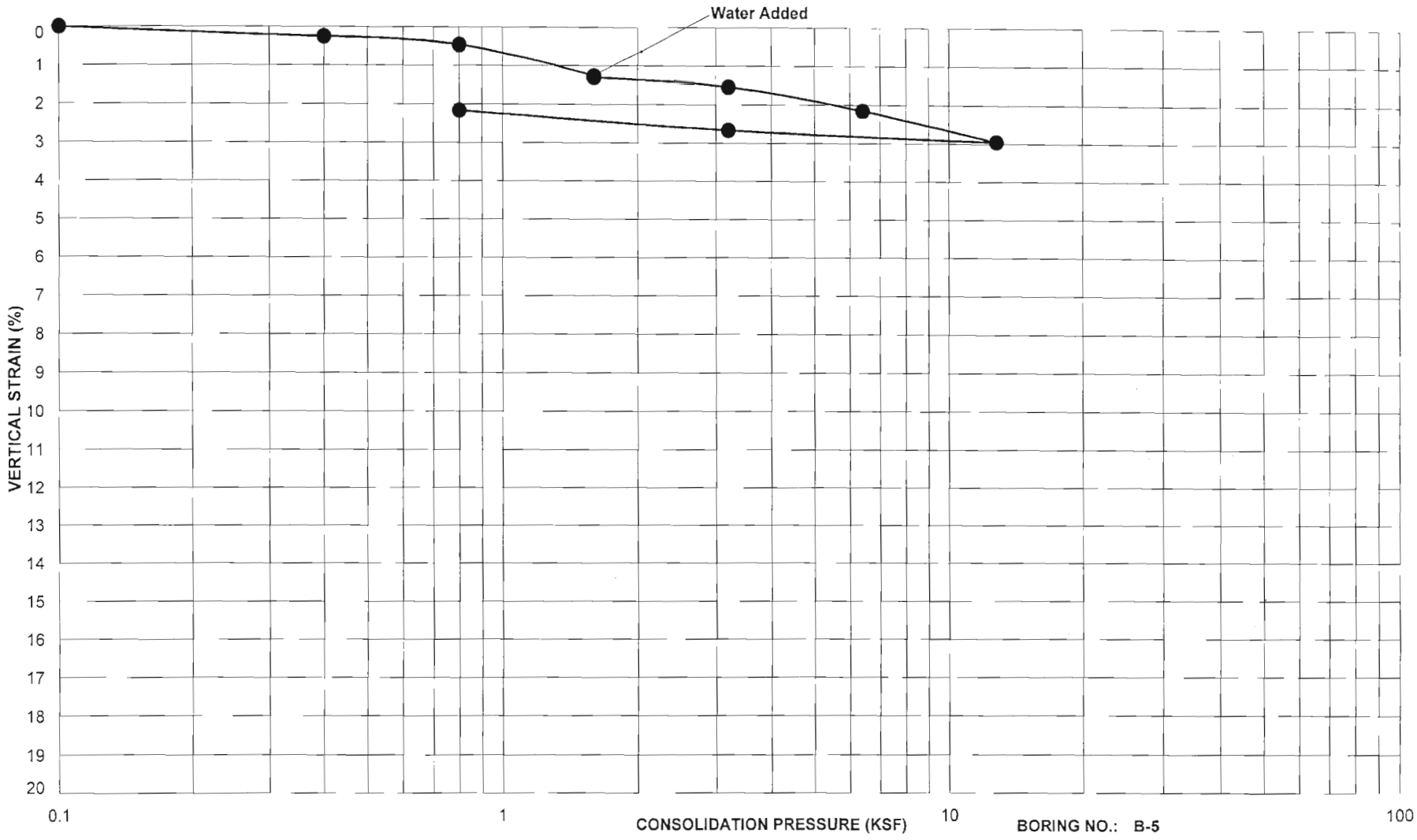
GEOBASE

Consolidation Test Results

Lake Forest Medical Office Building
Lake Forest, California

C.314.06.00

Figure C-4



BORING NO.: B-5

DEPTH (ft): 11.6 - 14.9

SAMPLE DESCRIPTION: SAND (Fill), brown, clayey, medium to coarse grained. Remolded to 95% relative compaction.

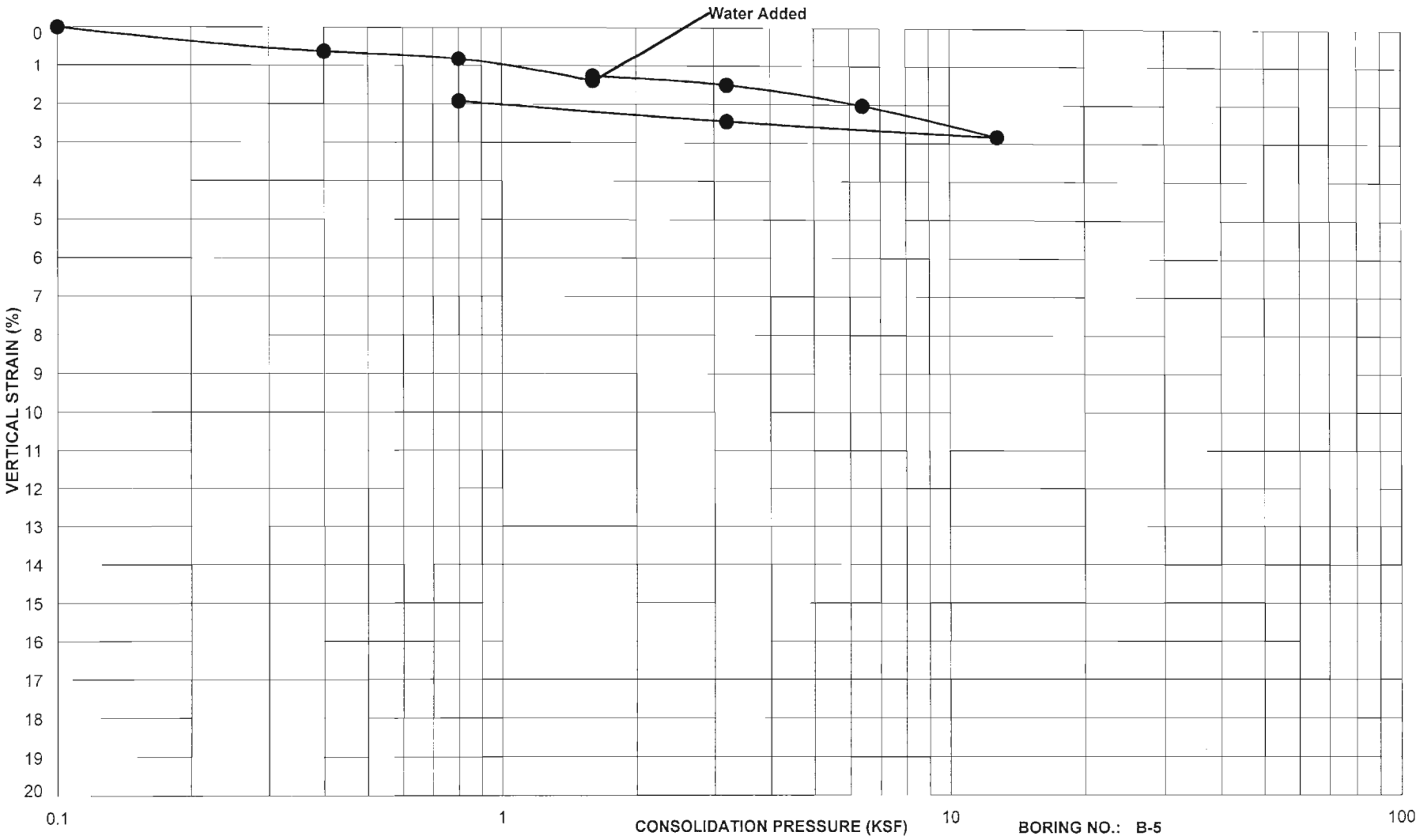
GEOBASE

Consolidation Test Results

Lake Forest Medical Office Building
Lake Forest, California

C.314.06.00

Figure C-5



BORING NO.: B-5

DEPTH (ft): 16.6 - 19.9

SAMPLE DESCRIPTION: SAND (Fill), brown, clayey, medium to coarse grained. Remolded to 95% relative compaction.

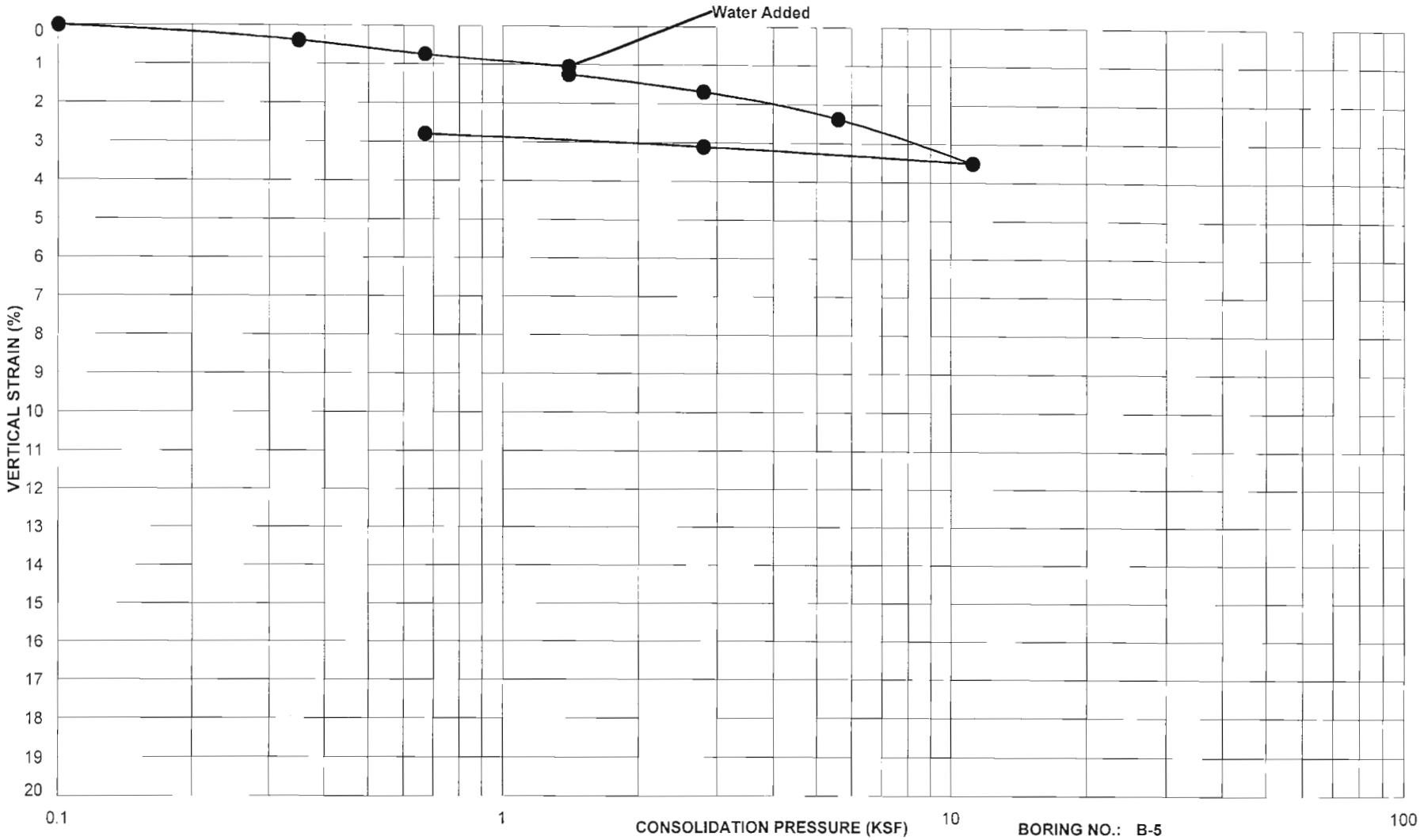
GEOBASE

Consolidation Test Results

Lake Forest Medical Office Building
Lake Forest, California

C.314.06.00

Figure C-6



BORING NO.: B-5

DEPTH (ft): 20.0 - 21.5

SAMPLE DESCRIPTION: SAND (Fill), brown, clayey, medium to coarse grained.

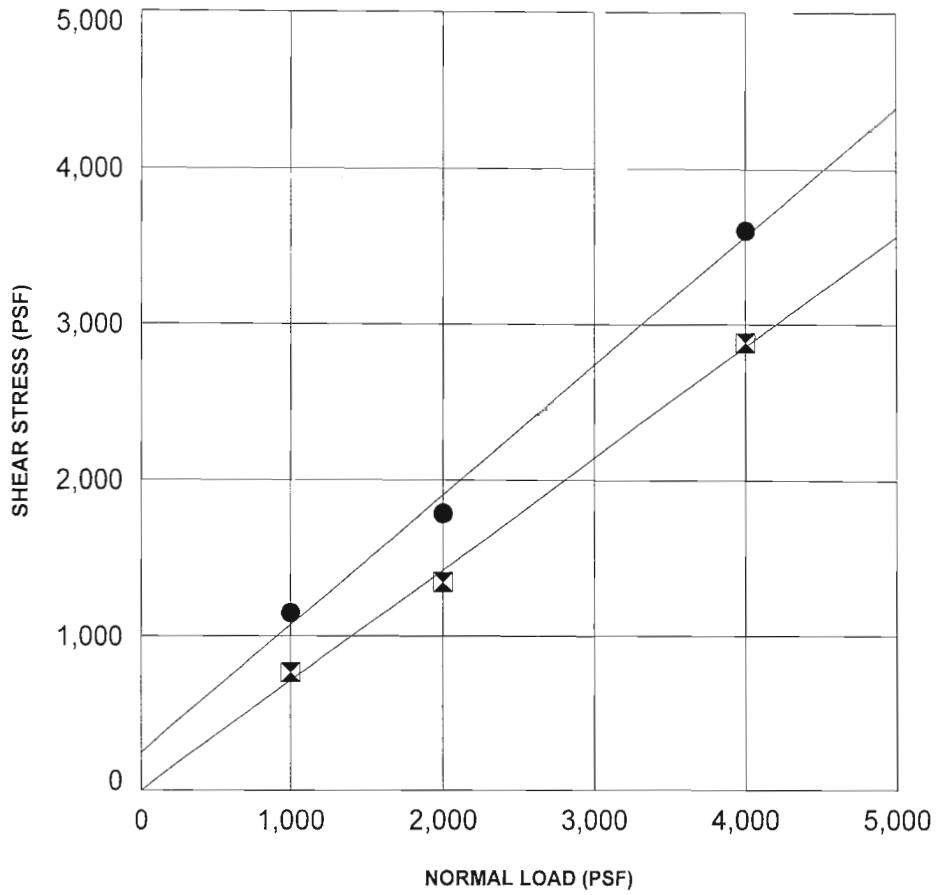
GEOBASE

Consolidation Test Results

Lake Forest Medical Office Building
Lake Forest, California

C.314.06.00

Figure C-7



				PEAK ●	ULTIMATE ⧓
SAMPLE DESCRIPTION: SC	HEIGHT (in): 25.4	DRY DENSITY (pcf): 119.2			
BORING NO.: B-5	AREA (sq in): 2943.01	INITIAL MOISTURE (%): 15.5	COHESION (psf)	244	0
DEPTH INTERVAL (ft): 10.0 - 10.5	SHEAR RATE (in/min): 0.002	FINAL MOISTURE (%): 20.0	FRICTION ANGLE (deg)	40	36
NOTES:					

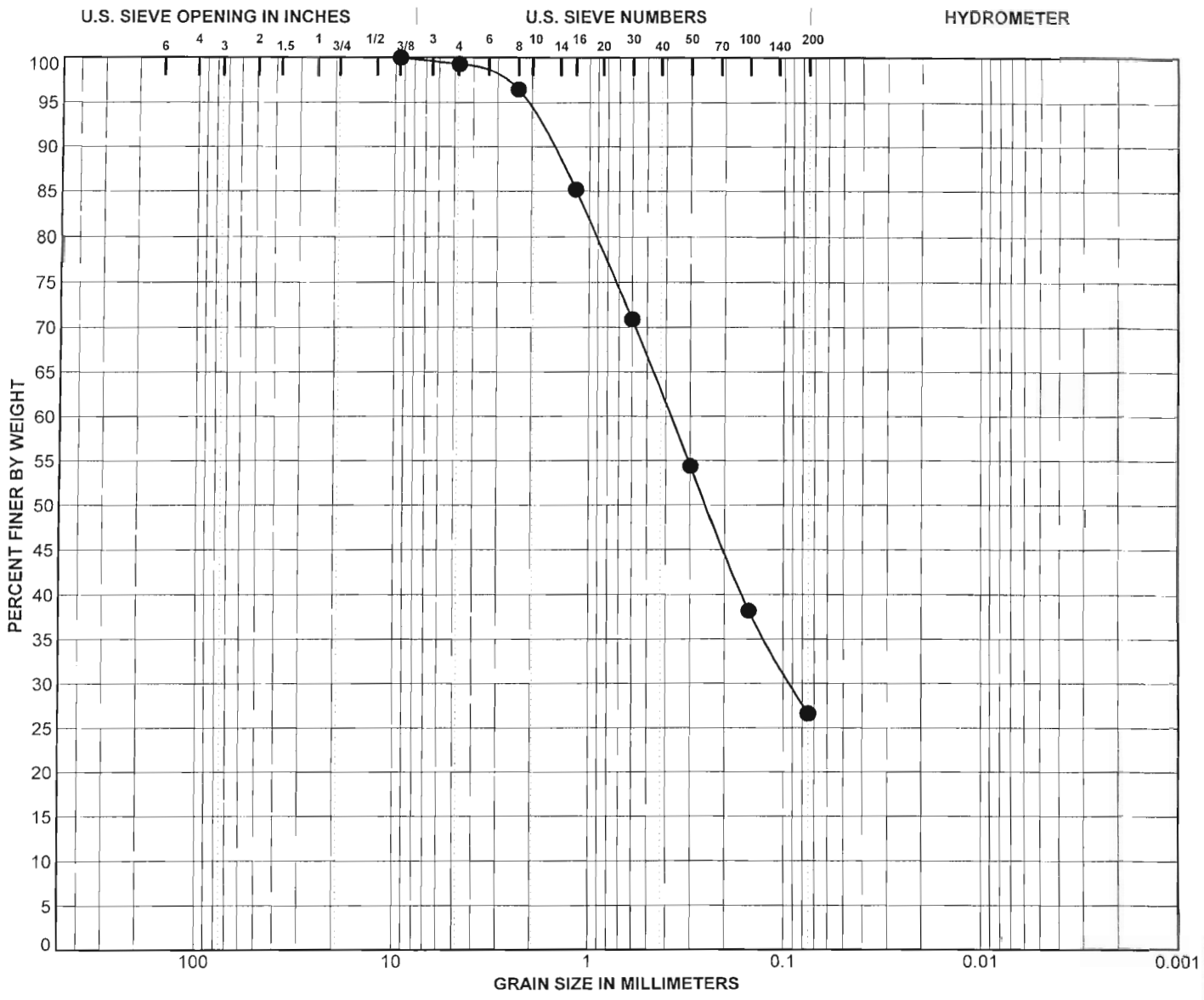
GEOBASE

Direct Shear Test Results

Lake Forest Medical Office Building
Lake Forest, California

C.314.06.00

Figure C-8



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BORING NO.: B-1
SAMPLE INTERVAL (ft): 5.0 - 5.3
SAMPLE DEPTH (ft): 5
USCS: Ss

GRAVEL: 0.7 %
SAND: 72.7 %
FINES: 26.6 %

D_{10} = mm
D_{30} = 0.09 mm
D_{50} = 0.25 mm
D_{60} = 0.38 mm

Cu =
Cc =

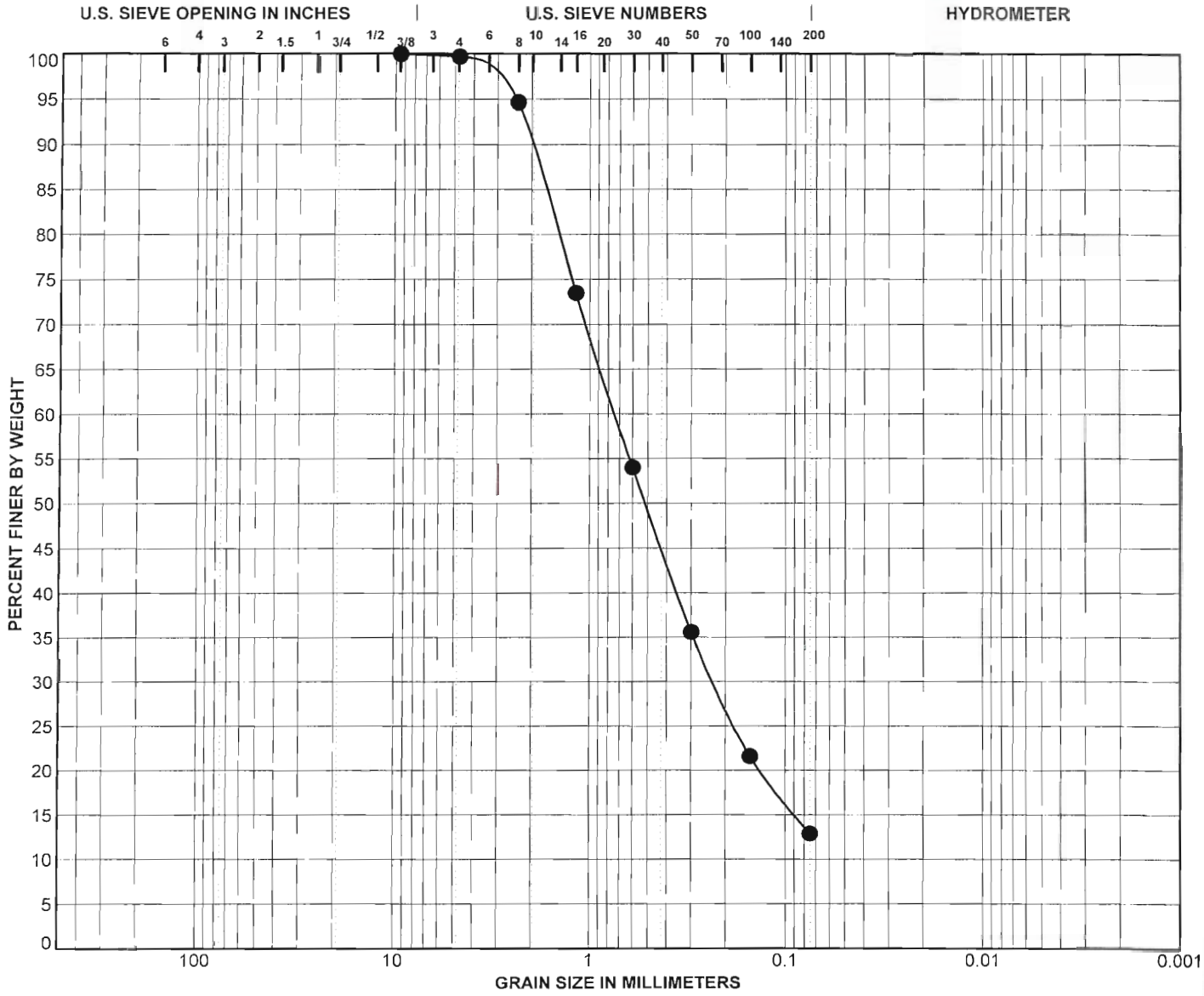
GEOBASE

Particle Size Distribution

Lake Forest Medical Office Building
Lake Forest, California

C.314.06.00

Figure C- 9



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BORING NO.: B-4
SAMPLE INTERVAL (ft): 15.0 - 15.5
SAMPLE DEPTH (ft): 15
USCS: Ss

GRAVEL: 0.3 %
SAND: 86.8 %
FINES: 12.9 %

D_{10} = mm
D_{30} = 0.23 mm
D_{50} = 0.52 mm
D_{60} = 0.74 mm

Cu =
Cc =

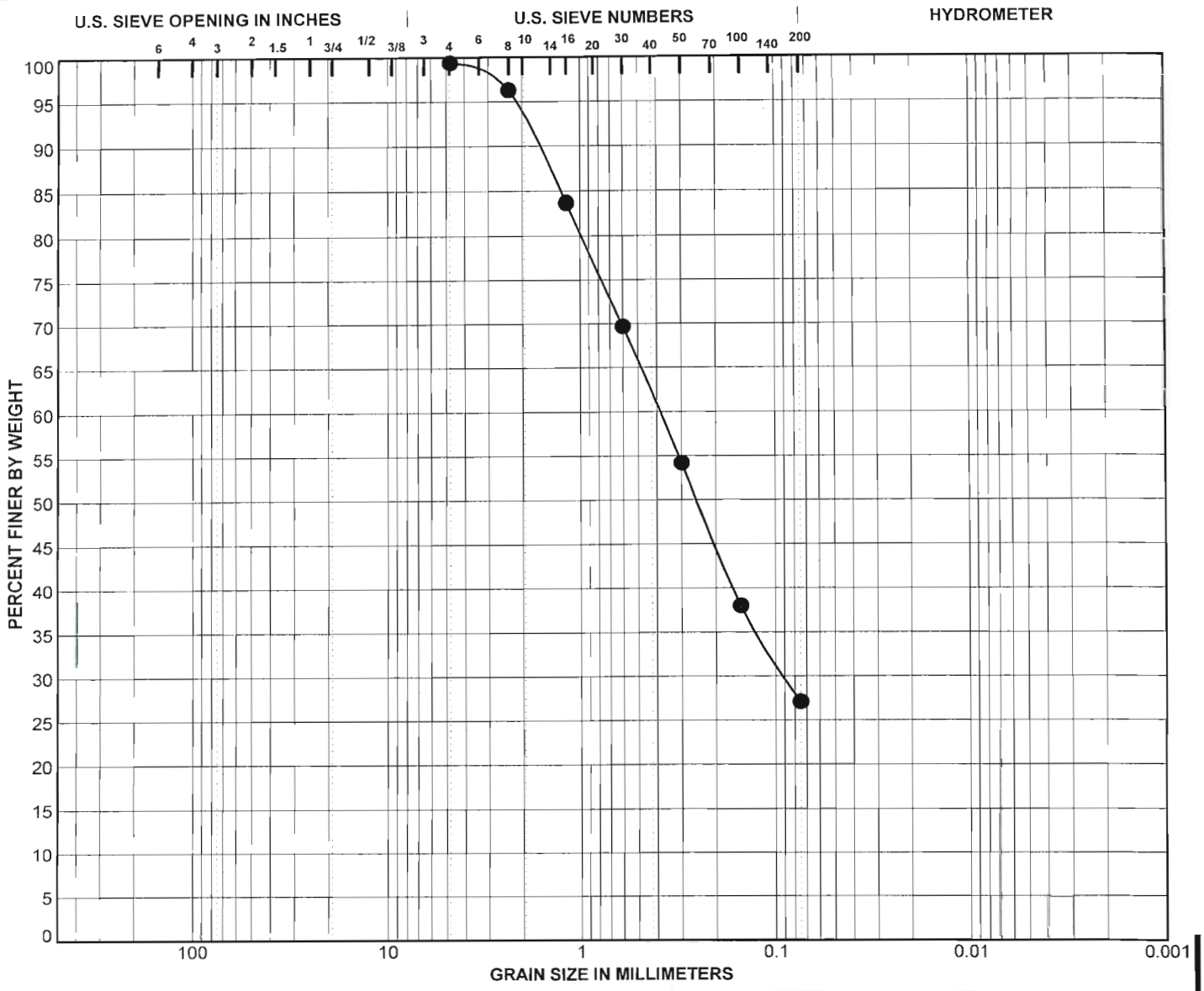
GEOBASE

Particle Size Distribution

Lake Forest Medical Office Building
Lake Forest, California

C.314.06.00

Figure C-10



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BORING NO.: B-5
SAMPLE INTERVAL (ft): 10.0 - 11.5
SAMPLE DEPTH (ft): 10
USCS: SC

GRAVEL: 0.0 %
SAND: 72.3 %
FINES: 27.1 %

D_{10} = mm
D_{30} = 0.09 mm
D_{50} = 0.25 mm
D_{60} = 0.39 mm

Cu =
Cc =

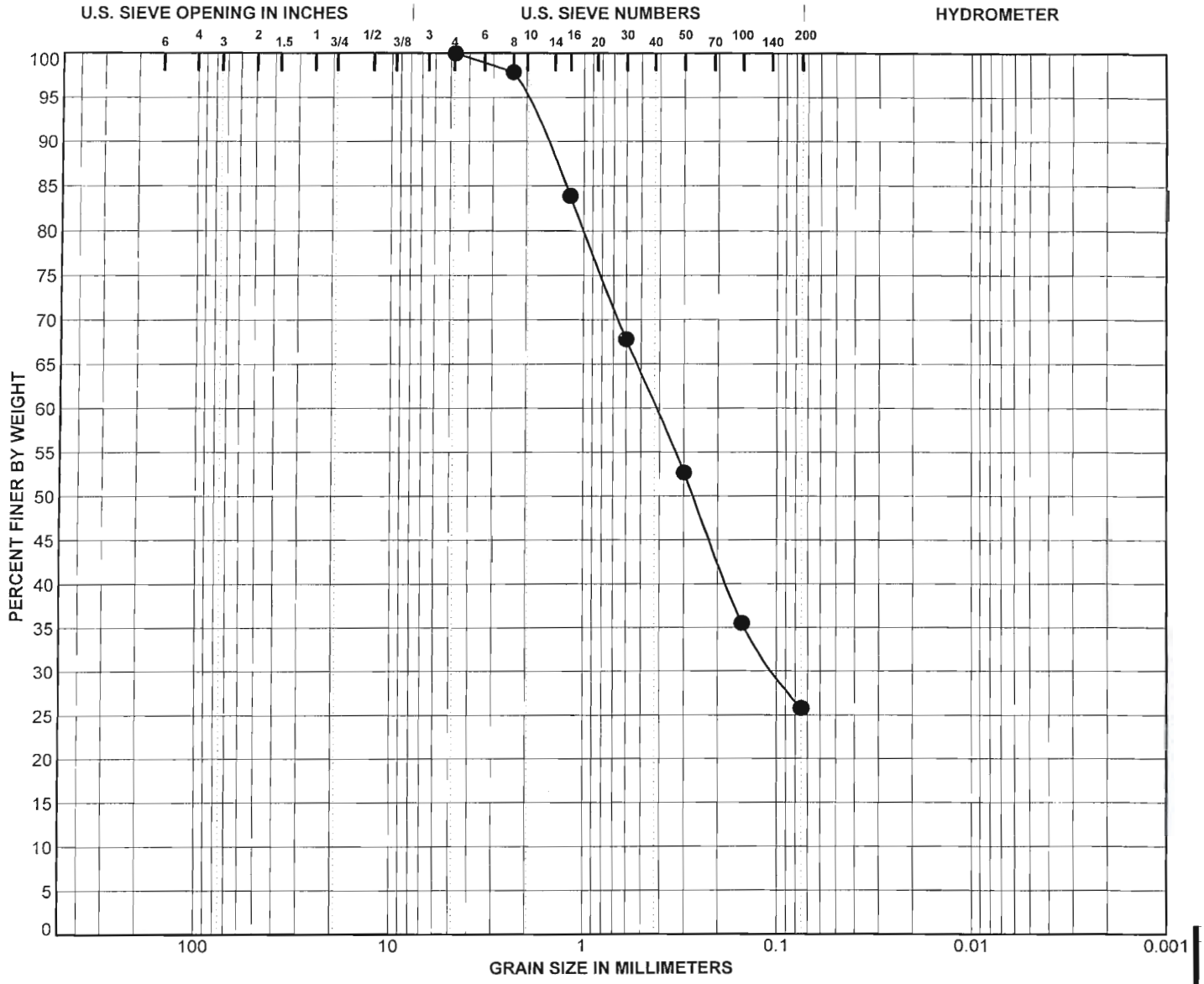
GEOBASE

Particle Size Distribution

Lake Forest Medical Office Building
Lake Forest, California

C.314.06.00

Figure C-11



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BORING NO.: B-5
SAMPLE INTERVAL (ft): 15.0 - 16.5
SAMPLE DEPTH (ft): 15
USCS: SC

GRAVEL: 0.0 %
SAND: 74.2 %
FINES: 25.8 %

D_{10} = mm
D_{30} = 0.10 mm
D_{50} = 0.27 mm
D_{60} = 0.42 mm

Cu =
Cc =

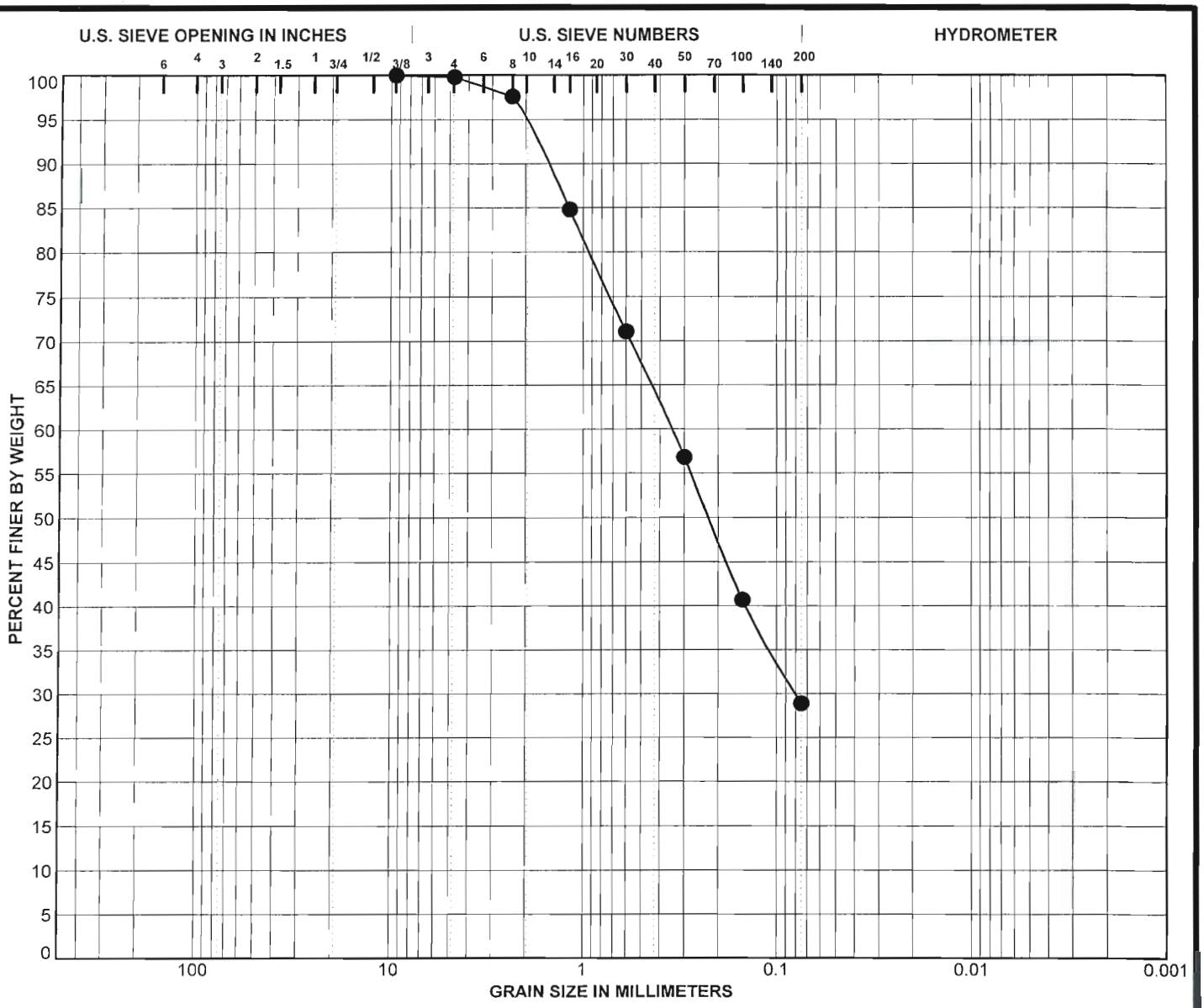
GEOBASE

Particle Size Distribution

Lake Forest Medical Office Building
Lake Forest, California

C.314.06.00

Figure C-12



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

BORING NO.: B-5
SAMPLE INTERVAL (ft): 20.0 - 21.5
SAMPLE DEPTH (ft): 20
USCS: SC

GRAVEL: 0.2 %
SAND: 70.9 %
FINES: 28.9 %

D_{10} = mm
D_{30} = 0.08 mm
D_{50} = 0.22 mm
D_{60} = 0.35 mm

Cu =
Cc =

GEOBASE

Particle Size Distribution

Lake Forest Medical Office Building
Lake Forest, California

C.314.06.00

Figure C-13

Figure C-14

EXPANSION POTENTIAL
U.B.C. No. 29-2

SOIL SAMPLE LOCATION (feet)	EXPANSION INDEX	EXPANSION POTENTIAL
B-1 at 0 to 5.0	4	Very Low
B-5 at 0 to 5.0	19	Very Low

WATER-SOLUBLE SULFATES
CAL. 417-A

SOIL SAMPLE LOCATION (feet)	SOLUBLE SULFATES PPM	POTENTIAL FOR ATTACK ON CONCRETE
B-2 at 0 to 5.0	663	Moderate
B-4 at 0 to 5.0	33	Low

CORROSIVITY SERIES TEST

SOIL SAMPLE LOCATION (feet)	pH (CAL 747)	SOLUBLE CHLORIDE (CAL.422) (PPM)	ELEC. RESISTIVITY (CAL.643) (OHM-CM)	POTENTIAL FOR ATTACK ON STEEL (SENATOROFF)
B-2 at 0 to 5.0	7.7	297	600 Maximum	Very Severe
B-4 at 0 to 5.0	8.0	223	2,190	Moderate

R-VALUE
(DEPARTMENT OF TRANSPORTATION, STATE OF CALIFORNIA,
MATERIALS AND RESEARCH TEST METHOD NO. 301)

SOIL SAMPLE LOCATION (feet)	R-VALUE BY EXUDATION
B-1 at 0 to 5.0	43
B-5 at 0 to 5.0	27

ANAHEIM TEST LABORATORY

3008 S. ORANGE AVENUE
SANTA ANA, CALIFORNIA 92707
PHONE (714) 549-7267

TO: GEO BASE:
23362 PERALTA DR. #4&6
LAGUNA HILLS, CA. 92653

ATTN: BOB

DATE: 2/27/03

P.O. No. VERBAL

Shipper No.

Lab. No. A-2786 1-2

Specification:

Material: SOIL

PROJECT: #C314.06.00

LAKE FOREST (MOB)

ANALYTICAL REPORT

CORROSION SERIES
SUMMARY OF DATA

	pH	SOLUBLE SULFATES per Ca. 417 ppm	SOLUBLE CHLORIDES per Ca. 422 ppm	MIN. RESISTIVITY per Ca. 643 ohm-cm
#1 B-2 @ 0-5'	7.7	663	297	600 max
#2 B-4 @ 0-5'	8.0	33	223	2,190

RESPECTFULLY SUBMITTED

POPPY BRIDGER Chief Chemist

FORM #2

FIGURE C-15

GEOBASE, INC.

Figure C-1

SUMMARY OF LABORATORY TEST RESULTS

PROJECT: Kaiser Foothill Ranch Medical Office Building
Lake Forest, California

PROJECT NO: C.314.44.00

DATE: May 31, 2011

BORING	DEPTH (feet)	MOISTURE CONTENT (Percent)	DRY DENSITY (pcf)	ATTERBERG LIMITS			PARTICLE SIZE DISTRIBUTION				OTHER TESTS	DESCRIPTION AND REMARKS
				LL (%)	PL (%)	PI (%)	CLAY (%)	SILT (%)	SAND (%)	GRAVEL (%)		
B-1	0-5.0	10										SM
	10.0-11.0	9	126.1									SM
	15.0-16.0	8										SM
	20.0-21.0	8	121.0									SM
	25.0-26.0	9										SM
	27.0-28.0	7										SM
	30.0-31.0	7										SM
	35.0-36.0	9										SM
	37.0-38.0	8										SM
	42.0-43.0	8	120.3									SM
	46.0-47.0	7										SANDSTONE
	54.0-55.0	6	119.3									SANDSTONE
B-2	5.0-6.0	11										SM
	10.0-11.0	9	122.8									SM
	15.0-16.0	10										SM
	20.0-25.0	9										SM
	25.0-26.0	10										SM
	30.0-31.0	9										SM
	32.0-33.0	8										SM
	35.0-36.0	8										SM
	40.0-41.0	9										SILTSTONE
	42.0-43.0	10	123.2									SANDSTONE

GEOBASE, INC.

Figure C-1

SUMMARY OF LABORATORY TEST RESULTS

PROJECT: Kaiser Foothill Ranch Medical Office Building
Lake Forest, California

PROJECT NO: C.314.44.00

DATE: May 31, 2011

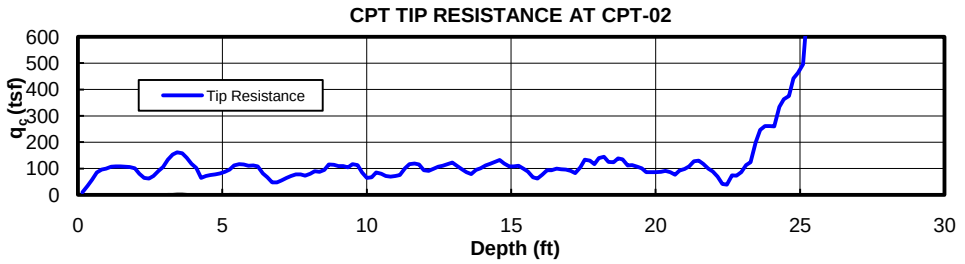
BORING	DEPTH (feet)	MOISTURE CONTENT (Percent)	DRY DENSITY (pcf)	ATTERBERG LIMITS			PARTICLE SIZE DISTRIBUTION				OTHER TESTS	DESCRIPTION AND REMARKS
				LL (%)	PL (%)	PI (%)	CLAY (%)	SILT (%)	SAND (%)	GRAVEL (%)		
B-3	5.0-6.0	10										SM
	10.0-11.0	10										SM
	15.0-16.0	9	124.2									SM
	20.0-21.0	17										SM
	28.0-29.0	6	127.5									SANDSTONE

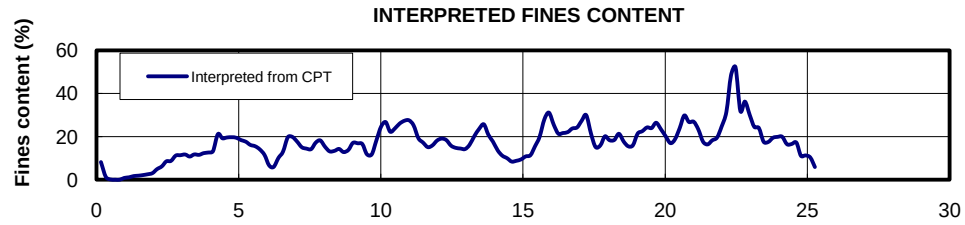
APPENDIX D

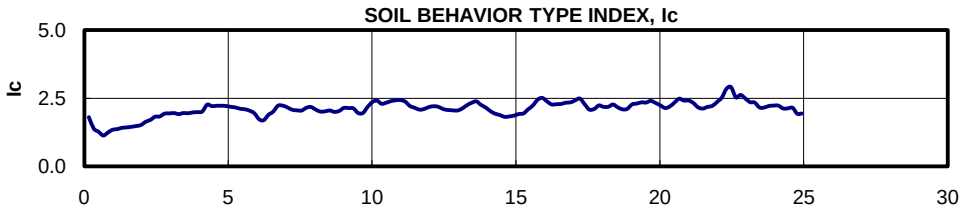
Seismic Settlement Analyses

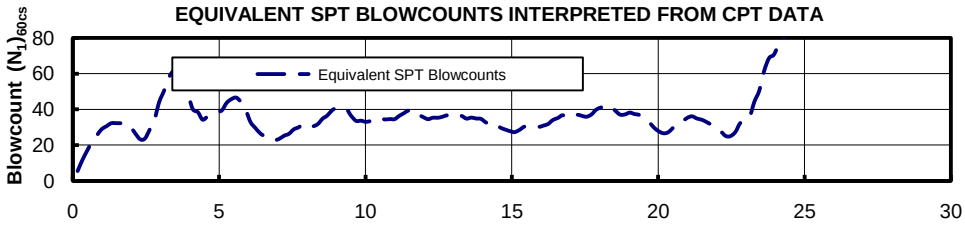
- CPT 2 -- Results
- CPT 4 -- Results
- CPT 6 -- Results
- Compact Disc – Calculations

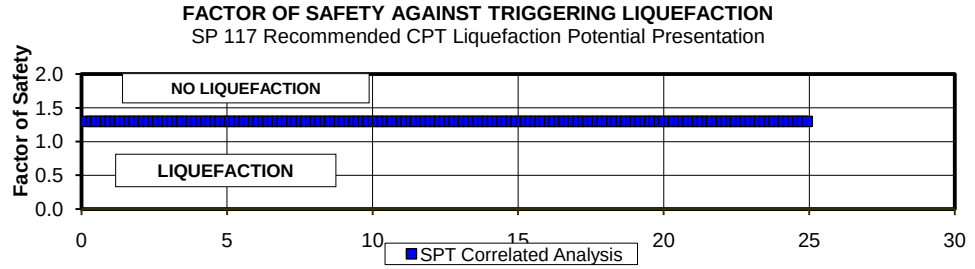
Percolation Tests Report

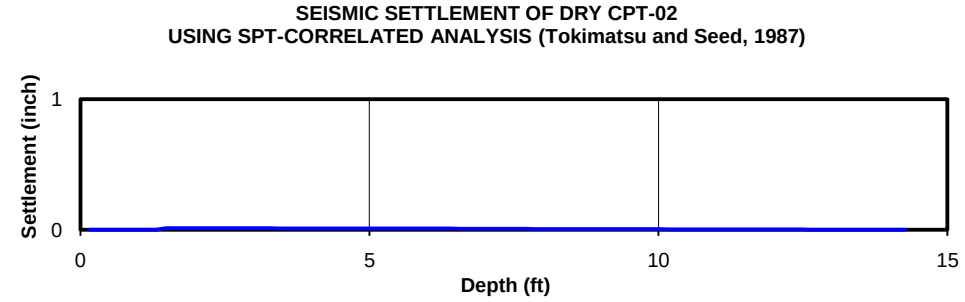

CPT TIP RESISTANCE AT CPT-02
q_c (tsf)
600
500
400
300
200
100
0
Tip Resistance
0
5
10
15
20
25
30
Depth (ft)

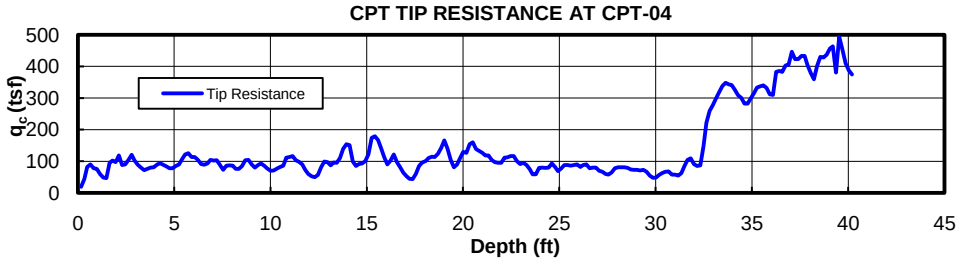

INTERPRETED FINES CONTENT
Fines content (%)
60
40
20
0
Interpreted from CPT
0
5
10
15
20
25
30

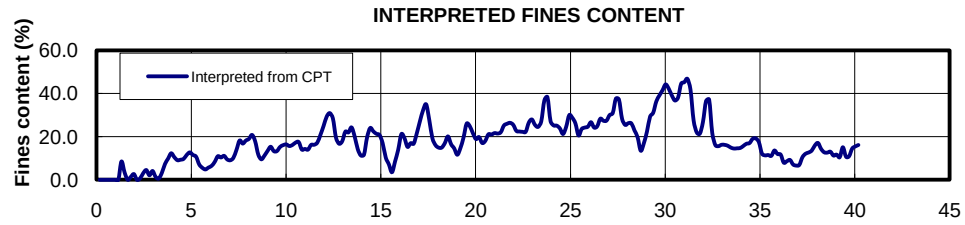

SOIL BEHAVIOR TYPE INDEX, Ic
Ic
5.0
2.5
0.0
0
5
10
15
20
25
30

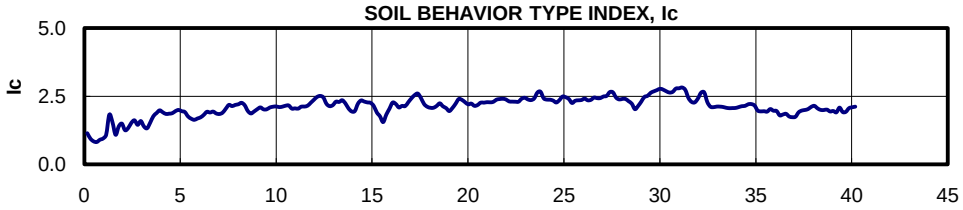

EQUIVALENT SPT BLOWCOUNTS INTERPRETED FROM CPT DATA
Blowcount $(N_1)_{60cs}$
80
60
40
20
0
Equivalent SPT Blowcounts
0
5
10
15
20
25
30

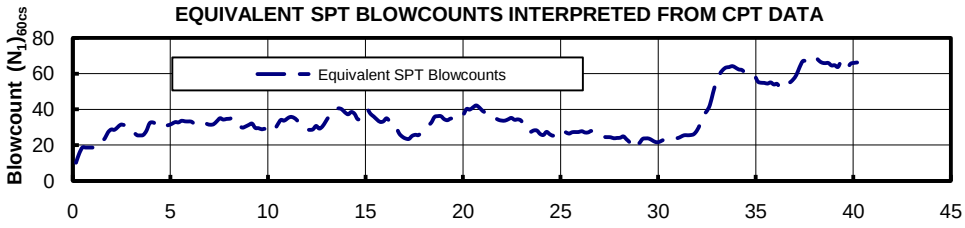

FACTOR OF SAFETY AGAINST TRIGGERING LIQUEFACTION
SP 117 Recommended CPT Liquefaction Potential Presentation
Factor of Safety
2.0
1.5
1.0
0.5
0.0
NO LIQUEFACTION
LIQUEFACTION
0
5
10
15
20
25
30
SPT Correlated Analysis

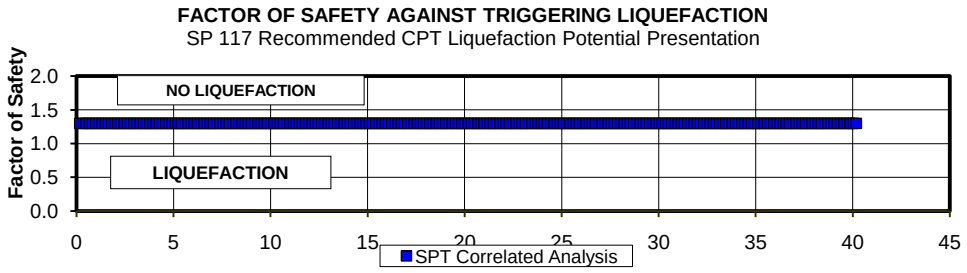

SEISMIC SETTLEMENT OF DRY CPT-02
USING SPT-CORRELATED ANALYSIS (Tokimatsu and Seed, 1987)
Settlement (inch)
1
0
0
5
10
15
Depth (ft)

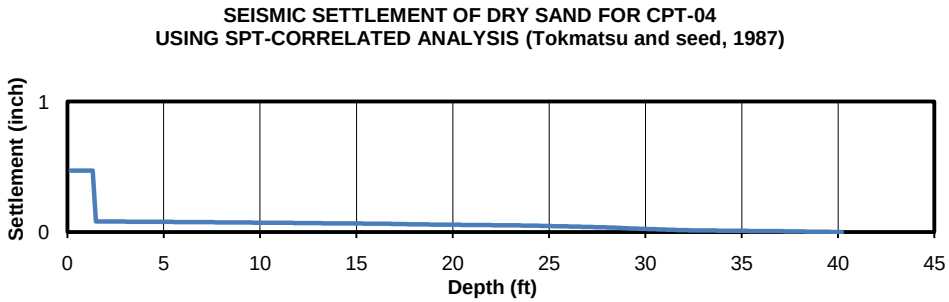

CPT TIP RESISTANCE AT CPT-04
Tip Resistance
q_c (tsf)
Depth (ft)

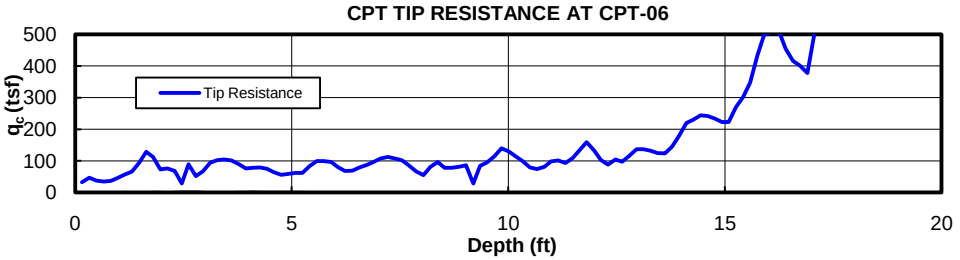

INTERPRETED FINES CONTENT
Interpreted from CPT
Fines content (%)

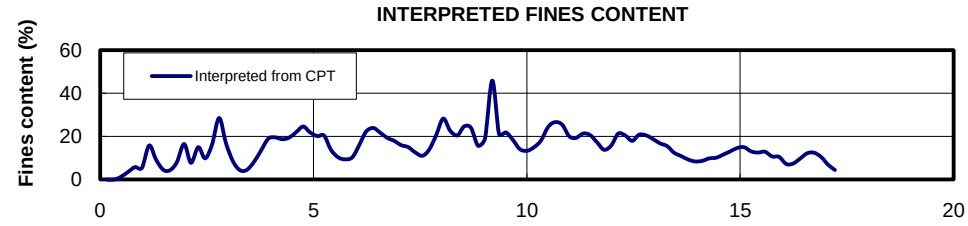

SOIL BEHAVIOR TYPE INDEX, Ic
Ic

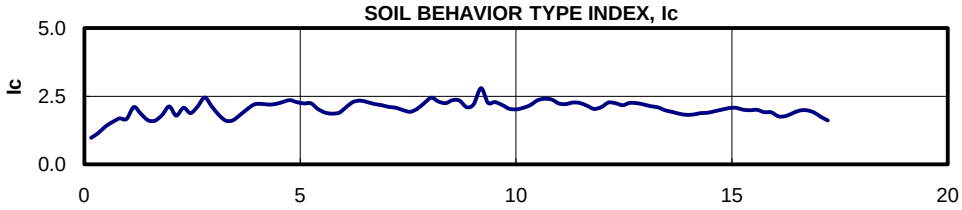

EQUIVALENT SPT BLOWCOUNTS INTERPRETED FROM CPT DATA
Equivalent SPT Blowcounts
Blowcount $(N_1)_{60cs}$

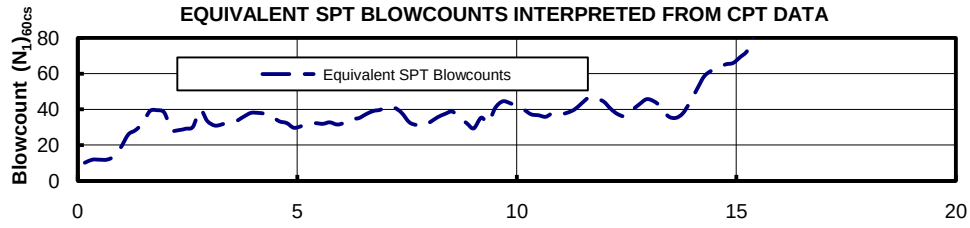

FACTOR OF SAFETY AGAINST TRIGGERING LIQUEFACTION
SP 117 Recommended CPT Liquefaction Potential Presentation
NO LIQUEFACTION
LIQUEFACTION
Factor of Safety
SPT Correlated Analysis

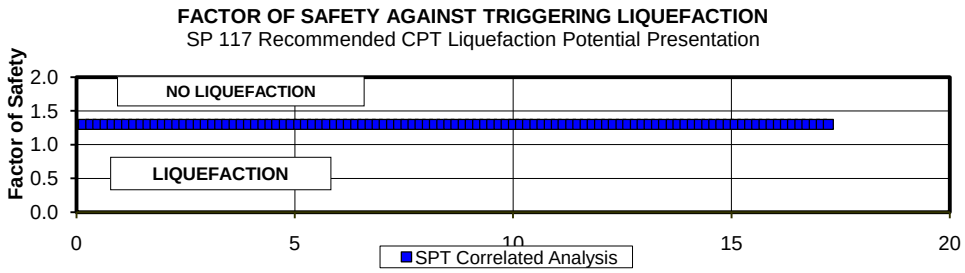

SEISMIC SETTLEMENT OF DRY SAND FOR CPT-04
USING SPT-CORRELATED ANALYSIS (Tokmatsu and seed, 1987)
Settlement (inch)
Depth (ft)

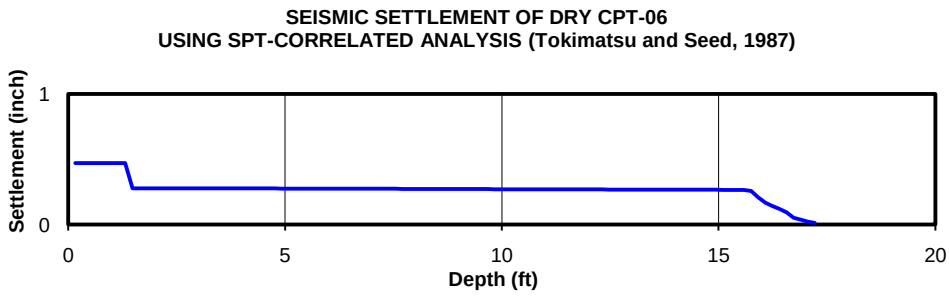

CPT TIP RESISTANCE AT CPT-06
q_c (tsf)
500
400
300
200
100
0
Tip Resistance
0
5
10
15
20
Depth (ft)


INTERPRETED FINES CONTENT
Fines content (%)
60
40
20
0
Interpreted from CPT
0
5
10
15
20


SOIL BEHAVIOR TYPE INDEX, Ic
Ic
5.0
2.5
0.0
0
5
10
15
20


EQUIVALENT SPT BLOWCOUNTS INTERPRETED FROM CPT DATA
Blowcount $(N_1)_{60cs}$
80
60
40
20
0
Equivalent SPT Blowcounts
0
5
10
15
20


FACTOR OF SAFETY AGAINST TRIGGERING LIQUEFACTION
SP 117 Recommended CPT Liquefaction Potential Presentation
Factor of Safety
2.0
1.5
1.0
0.5
0.0
NO LIQUEFACTION
LIQUEFACTION
0
5
10
15
20
SPT Correlated Analysis


SEISMIC SETTLEMENT OF DRY CPT-06
USING SPT-CORRELATED ANALYSIS (Tokimatsu and Seed, 1987)
Settlement (inch)
1
0
0
5
10
15
20
Depth (ft)

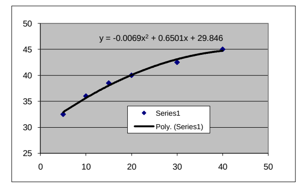
C.314.41.00 KAISER LAKE FOREST MOB

SEISMIC SETTLEMENT OF DRY SAND AT CPT02
USING EQUIVALENT SPT ANALYSIS (Tokimatsu and Seed, 1987)

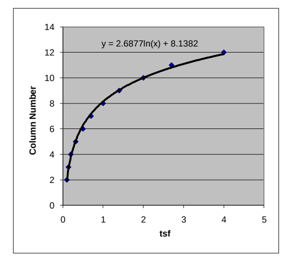
Depth of layer base(ft)	Layer thickness (ft)	Average layer depth (ft)	avg layer stress (tsf)	(N1-60)cs	K2-max	G-max	r-d	gama-e*(G-e/G-m)	gamma-e-calculated	epsln-c (M=7.5)-calculated	epsln-c (M=6.8)	2*epsln-c (M=6.8)	settlement (in)	Cumulative settlement (inch)	**Depth (ft) of top of layer**	**sig-v tsf**	**column Number**	**x**	**y**	gamma-e-calculated	gamma-e-read from curve	epsilon-c-calculated	epsilon-c-read off curve
0.2	0.2	0.085	0.00	5.5	35	107974	1.0007	2.09E-05	2.11E-05	1.01E-04	8.55E-05	1.71E-04	0.0003	#VALUE!	**0.0**	**0.00**	**6**	**3.2**	**3.2**	**2.1E-05**	**-1.1E+01**	**1.0E-04**	
0.3	0.2	0.245	0.01	11.9	46	236846	1.0007	2.75E-05	2.08E-05	4.54E-05	3.86E-05	7.71E-05	0.0002	#VALUE!	**0.2**	**0.01**	**3**	**4.4**	**3.2**	**2.1E-05**	**-1.0E+01**	**4.5E-05**	
0.5	0.2	0.41	0.02	17.0	51	345031	1.0006	3.15E-05	3.25E-05	4.19E-05	3.56E-05	7.12E-05	0.0001	#VALUE!	**0.3**	**0.02**	**2**	**5.0**	**5.1**	**3.3E-05**	**-9.0E+00**	**4.2E-05**	
0.7	0.2	0.575	0.03	22.1	56	445906	1.0003	3.42E-05	2.96E-05	2.44E-05	2.07E-05	4.14E-05	0.0001	#VALUE!	**0.5**	**0.03**	**1**	**5.3**	**4.7**	**3.0E-05**	**-8.0E+00**	**2.4E-05**	
0.8	0.2	0.74	0.04	25.5	59	530542	1.0001	3.70E-05	2.96E-05	1.89E-05	1.61E-05	3.22E-05	0.0001	#VALUE!	**0.7**	**0.04**	**1**	**5.7**	**4.7**	**3.0E-05**	**-7.0E+00**	**1.9E-05**	
1.0	0.2	0.9	0.05	28.9	61	609995	0.9998	3.91E-05	2.96E-05	1.53E-05	1.30E-05	2.60E-05	0.0000	#VALUE!	**0.8**	**0.05**	**1**	**5.9**	**4.7**	**3.0E-05**	**-6.0E+00**	**1.5E-05**	
1.2	0.2	1.065	0.06	30.6	62	676311	0.9994	4.17E-05	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	**1.0**	**0.06**	**1**	**6.2**	**######**	**#VALUE!**	**-5.0E+00**	**#VALUE!**	
1.3	0.2	1.23	0.07	32.3	64	740020	0.9991	4.40E-05	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	**1.2**	**0.07**	**1**	**6.4**	**######**	**#VALUE!**	**-4.0E+00**	**#VALUE!**	
1.5	0.2	1.395	0.08	32.3	64	788094	0.9987	4.69E-05	3.99E-05	1.72E-05	1.47E-05	2.93E-05	0.0001	0.01	**1.3**	**0.08**	**1**	**6.7**	**6.0**	**4.0E-05**	**-3.0E+00**	**1.7E-05**	
1.6	0.2	1.56	0.09	32.3	64	833047	0.9983	4.96E-05	4.94E-05	2.14E-05	1.82E-05	3.64E-05	0.0001	0.01	**1.5**	**0.09**	**2**	**7.0**	**6.9**	**4.9E-05**	**-2.0E+00**	**2.1E-05**	
1.8	0.2	1.72	0.09	32.0	63	872583	0.998	5.22E-05	4.94E-05	2.16E-05	1.84E-05	3.68E-05	0.0001	0.01	**1.6**	**0.09**	**2**	**7.2**	**6.9**	**4.9E-05**	**-1.0E+00**	**2.2E-05**	
2.0	0.5	1.72	0.09	30.1	62	854930	0.998	5.33E-05	4.94E-05	2.38E-05	2.03E-05	4.05E-05	0.0002	0.01	**1.5**	**0.09**	**2**	**7.3**	**6.9**	**4.9E-05**	**4.0E-03**	**2.4E-05**	
2.1	0.2	2.05	0.11	26.6	60	895282	0.9972	6.06E-05	8.38E-05	5.00E-05	4.25E-05	8.49E-05	0.0002	0.01	**2.0**	**0.11**	**2**	**7.8**	**9.2**	**8.4E-05**	**1.0E+00**	**5.0E-05**	
2.3	0.2	2.215	0.12	23.3	57	890126	0.9968	6.58E-05	8.38E-05	6.31E-05	5.37E-05	1.07E-04	0.0002	0.01	**2.1**	**0.12**	**2**	**8.2**	**9.2**	**8.4E-05**	**2.0E+00**	**6.3E-05**	
2.5	0.2	2.38	0.13	23.7	57	928516	0.9964	6.78E-05	8.38E-05	6.11E-05	5.19E-05	1.04E-04	0.0002	0.01	**2.3**	**0.13**	**3**	**8.3**	**9.2**	**8.4E-05**	**3.0E+00**	**6.1E-05**	
2.6	0.2	2.54	0.14	28.6	61	1E+06	0.9961	6.58E-05	8.38E-05	4.42E-05	3.76E-05	7.51E-05	0.0001	0.01	**2.5**	**0.14**	**3**	**8.2**	**9.2**	**8.4E-05**	**4.0E+00**	**4.4E-05**	
2.8	0.2	2.705	0.15	34.5	65	1E+06	0.9957	6.37E-05	8.04E-05	3.16E-05	2.69E-05	5.38E-05	0.0001	0.01	**2.6**	**0.15**	**3**	**8.0**	**9.1**	**8.0E-05**	**5.0E+00**	**3.2E-05**	
3.0	0.2	2.87	0.16	44.2	71	1E+06	0.9953	6.04E-05	8.04E-05	2.49E-05	2.11E-05	4.23E-05	0.0001	0.01	**2.8**	**0.16**	**3**	**7.8**	**9.1**	**8.0E-05**	**6.0E+00**	**2.5E-05**	
3.1	0.2	3.035	0.17	50.7	74	1E+06	0.9949	5.93E-05	6.32E-05	1.97E-05	1.67E-05	3.34E-05	0.0001	0.01	**3.0**	**0.17**	**3**	**7.7**	**8.0**	**6.3E-05**	**7.0E+00**	**2.0E-05**	
3.3	0.2	3.2	0.18	57.9	77	1E+06	0.9945	5.82E-05	6.32E-05	2.32E-05	1.97E-05	3.94E-05	0.0001	0.01	**3.1**	**0.18**	**3**	**7.7**	**8.0**	**6.3E-05**	**8.0E+00**	**2.3E-05**	
3.4	0.2	3.36	0.18	61.3	79	2E+06	0.9941	5.85E-05	6.32E-05	2.66E-05	2.26E-05	4.52E-05	0.0001	0.01	**3.3**	**0.18**	**4**	**7.7**	**8.0**	**6.3E-05**	**9.0E+00**	**2.7E-05**	
3.6	0.2	3.525	0.19	59.2	78	2E+06	0.9937	6.06E-05	8.04E-05	3.09E-05	2.63E-05	5.26E-05	0.0001	0.01	**3.4**	**0.19**	**4**	**7.8**	**9.1**	**8.0E-05**	**1.0E+01**	**3.1E-05**	
3.8	0.2	3.69	0.20	54.5	76	2E+06	0.9933	6.37E-05	8.04E-05	2.68E-05	2.28E-05	4.55E-05	0.0001	0.01	**3.6**	**0.20**	**4**	**8.0**	**9.1**	**8.0E-05**	**1.1E+01**	**2.7E-05**	
3.9	0.2	3.855	0.21	48.0	73	1E+06	0.9929	6.79E-05	8.04E-05	2.46E-05	2.09E-05	4.18E-05	0.0001	0.01	**3.8**	**0.21**	**4**	**8.3**	**9.1**	**8.0E-05**	**1.2E+01**	**2.5E-05**	
4.1	0.2	4.02	0.22	40.1	68	1E+06	0.9925	7.36E-05	7.71E-05	2.55E-05	2.16E-05	4.33E-05	0.0001	0.01	**3.9**	**0.22**	**4**	**8.7**	**8.9**	**7.7E-05**	**1.3E+01**	**2.5E-05**	
4.3	0.2	4.185	0.23	38.5	67	1E+06	0.9921	7.61E-05	7.71E-05	2.65E-05	2.25E-05	4.50E-05	0.0001	0.01	**4.1**	**0.23**	**4**	**8.8**	**8.9**	**7.7E-05**	**1.4E+01**	**2.6E-05**	
4.4	0.2	4.35	0.24	34.3	65	1E+06	0.9918	8.06E-05	1.12E-04	4.45E-05	3.78E-05	7.56E-05	0.0001	0.01	**4.3**	**0.24**	**4**	**9.1**	**10.5**	**1.1E-04**	**1.5E+01**	**4.4E-05**	
4.6	0.2	4.51	0.25	35.8	66	1E+06	0.9914	8.09E-05	1.12E-04	4.19E-05	3.56E-05	7.12E-05	0.0001	0.01	**4.4**	**0.25**	**4**	**9.1**	**10.5**	**1.1E-04**	**1.6E+01**	**4.2E-05**	
4.8	0.2	4.675	0.26	37.3	67	2E+06	0.991	8.12E-05	1.12E-04	3.99E-05	3.39E-05	6.79E-05	0.0001	0.01	**4.6**	**0.26**	**4**	**9.1**	**10.5**	**1.1E-04**	**1.7E+01**	**4.0E-05**	
4.9	0.2	4.84	0.27	38.5	67	2E+06	0.9906	8.17E-05	1.12E-04	3.85E-05	3.27E-05	6.54E-05	0.0001	0.01	**4.8**	**0.27**	**5**	**9.1**	**10.5**	**1.1E-04**	**1.8E+01**	**3.8E-05**	
5.1	0.2	5.005	0.28	39.4	68	2E+06	0.9902	8.24E-05	1.12E-04	3.76E-05	3.19E-05	6.39E-05	0.0001	0.01	**4.9**	**0.28**	**5**	**9.2**	**10.5**	**1.1E-04**	**1.9E+01**	**3.8E-05**	
5.3	0.2	5.17	0.28	43.6	70	2E+06	0.9898	8.10E-05	1.12E-04	3.49E-05	2.97E-05	5.94E-05	0.0001	0.01	**5.1**	**0.28**	**5**	**9.1**	**10.5**	**1.1E-04**	**2.0E+01**	**3.5E-05**	
5.4	0.2	5.33	0.29	45.7	71	2E+06	0.9895	8.09E-05	1.12E-04	3.44E-05	2.92E-05	5.84E-05	0.0001	0.01	**5.3**	**0.29**	**5**	**9.1**	**10.5**	**1.1E-04**	**2.1E+01**	**3.4E-05**	
5.6	0.2	5.495	0.30	46.6	72	2E+06	0.9891	8.16E-05	1.12E-04	3.43E-05	2.91E-05	5.82E-05	0.0001	0.01	**5.4**	**0.30**	**5**	**9.1**	**10.5**	**1.1E-04**	**2.2E+01**	**3.4E-05**	
5.7	0.2	5.66	0.31	44.1	71	2E+06	0.9887	8.43E-05	1.07E-04	3.32E-05	2.82E-05	5.64E-05	0.0001	0.01	**5.6**	**0.31**	**5**	**9.3**	**10.3**	**1.1E-04**	**2.3E+01**	**3.3E-05**	
5.9	0.2	5.825	0.32	39.5	68	2E+06	0.9883	8.87E-05	1.07E-04	3.59E-05	3.05E-05	6.09E-05	0.0001	0.01	**5.7**	**0.32**	**5**	**9.5**	**10.3**	**1.1E-04**	**2.4E+01**	**3.6E-05**	
6.1	0.2	5.99	0.33	32.9	64	2E+06	0.9879	9.56E-05	1.07E-04	4.51E-05	3.83E-05	7.67E-05	0.0001	0.01	**5.9**	**0.33**	**5**	**9.8**	**10.3**	**1.1E-04**	**2.5E+01**	**4.5E-05**	
6.2	0.2	6.15	0.34	29.7	62	2E+06	0.9876	1.00E-04	1.43E-04	7.04E-05	5.98E-05	1.20E-04	0.0002	0.01	**6.1**	**0.34**	**5**	**10.0**	**11.5**	**1.4E-04**	**2.6E+01**	**7.0E-05**	
6.4	0.2	6.315	0.35	26.6	60	2E+06	0.9872	1.05E-04	1.43E-04	8.46E-05	7.19E-05	1.44E-04	0.0003	0.01	**6.2**	**0.35**	**5**	**10.2**	**11.5**	**1.4E-04**	**2.7E+01**	**8.5E-05**	
6.6	0.2	6.48	0.36	25.0	58	2E+06	0.9868	1.09E-04	1.43E-04	9.48E-05	8.06E-05	1.61E-04	0.0003	0.01	**6.4**	**0.36**	**5**	**10.4**	**11.5**	**1.4E-04**	**2.8E+01**	**9.5E-05**	
6.7	0.2	6.645	0.37	24.4	58	2E+06	0.9865	1.11E-04	1.43E-04	9.85E-05	8.37E-05	1.67E-04	0.0003	0.01	**6.6**	**0.37**	**5**	**10.5**	**11.5**	**1.4E-04**	**2.9E+01**	**9.8E-05**	
6.9	0.2	6.81	0.37	22.9	57	2E+06	0.9861	1.15E-04	1.43E-04	1.11E-04	9.41E-05	1.88E-04	0.0004	0.01	**6.7**	**0.37**	**5**	**10.6**	**11.5**	**1.4E-04**	**3.0E+01**	**1.1E-04**	
7.1	0.2	6.97	0.38	23.5	57	2E+06	0.9857	1.15E-04	1.43E-04	1.05E-04	8.93E-05	1.79E-04	0.0003	0.01	**6.9**	**0.38**	**6**	**10.6**	**11.5**	**1.4E-04**	**3.1E+01**	**1.1E-04**	
7.2	0.2	7.135	0.39	25.3	59	2E+06	0.9854	1.14E-04	1.43E-04	9.26E-05	7.87E-05	1.57E-04	0.0003	0.01	**7.1**	**0.39**	**6**	**10.6**	**11.5**	**1.4E-04**	**3.2E+01**	**9.3E-05**	
7.4	0.2	7.3	0.40	26.3	59	2E+06	0.985	1.13E-04	1.43E-04	8.65E-05	7.35E-05	1.47E-04	0.0003	0.01	**7.2**	**0.40**	**6**	**10.5**	**11.5**	**1.4E-04**	**3.3E+01**	**8.6E-05**	
7.6	0.2	7.465	0.41	28.9	61	2E+06	0.9846	1.11E-04	1.43E-04	7.38E-05	6.27E-05	1.25E-04	0.0003	0.01	**7.4**	**0.41**	**6**	**10.5**	**11.5**	**1.4E-04**	**3.4E+01**	**7.4E-05**	
7.7	0.2	7.63	0.42	29.9	62	2E+06	0.9843	1.11E-04	1.43E-04	6.94E-05	5.90E-05	1.18E-04	0.0002	0.01	**7.6**	**0.42**	**6**	**10.4**	**11.5**	**1.4E-04**	**3.5E+01**	**6.9E-05**	
7.9	0.2	7.79	0.43	31.6	63	2E+06	0.9839	1.10E-04	1.43E-04	6.37E-05	5.41E-05	1.08E-04	0.0002	0.01	**7.7**	**0.43**	**6**	**10.4**	**11.5**	**1.4E-04**	**3.6E+01**	**6.4E-05**	
8.0	0.2	7.955	0.44	30.2	62	2E+06	0.9835	1.13E-04	1.43E-04	6.83E-05	5.81E-05	1.16E-04	0.0002	0.01	**7.9**	**0.44**	**6**	**10.5**	**11.5**	**1.4E-04**	**3.7E+01**	**6.8E-05**	
8.2	0.2	8.12	0.45	30.5	62	2E+06	0.9832	1.14E-04	1.43E-04	6.74E-05	5.73E-05	1.15E-04	0.0002	0.01	**8.0**	**0.45**	**6**	**10.6**	**11.5**	**1.4E-04**	**3.8E+01**	**6.7E-05**	
8.4	0.2	8.285	0.46	31.8	63	2E+06	0.9828	1.13E-04	1.33E-04	5.90E-05	5.02E-05	1.00E-04	0.0002	0.01	**8.2**	**0.46**	**6**	**10.5**	**11.3**	**1.3E-04**	**3.9E+01**	**5.9E-05**	
8.5	0.2	8.45	0.46	34.8	65	2E+06	0.9825	1.11E-04	1.33E-04	5.18E-05	4.41E-05	8.81E-05	0.0002	0.01	**8.4**	**0.46**	**6**	**10.4**	**11.3**	**1.3E-04**	**4.0E+01**	**5.2E-05**	
8.7	0.2	8.61	0.47	36.5	66	2E+06	0.9821	1.10E-04	1.33E-04	4.86E-05	4.13E-05	8.26E-05	0.0002	0.01	**8.5**	**0.47**	**6**	**10.4**	**11.3**	**1.3E-04**	**4.1E+01**	**4.9E-05**	
8.9	0.2	8.775	0.48	39.5	68	2E+06	0.9818	1.08E-04	1.33E-04	4.46E-05	3.79E-05	7.58E-05	0.0002	0.01	**8.7**	**0.48**	**6**	**10.3**	**11.3**	**1.3E-04**	**4.2E+01**	**4.5E-05**	
9.0	0.2	8.94	0.49	40.9	69	2E+06	0.9814	1.08E-04	1.33E-04	4.33E-05	3.68E-05	7.36E-05	0.0001	0.01	**8.9**	**0.49**	**6**	**10.3**	**11.3**	**1.3E-04**	**4.3E+01**	**4.3E-05**	
9.2	0.2	9.105	0.50	40.6	69	2E+06	0.981	1.09E-04	1.33E-04	4.35E-05	3.70E-05	7.40E-05	0.0002	0.01	**9.0**	**0.50**	**6**	**10.4**	**11.3**	**1.3E-04**	**4.4E+01**	**4.4E-05**	
9.4	0.2	9.27	0.51	40.2	68	2E+06	0.9807	1.10E-04	1.33E-04	4.39E-05	3.73E-05	7.46E-05	0.0001	0.01	**9.2**	**0.51**	**6**	**10.4**	**11.3**	**1.3E-04**	**4.5E+01**	**4.4E-05**	
9.5	0.2	9.43	0.52	36.4	66	2E+06	0.9803	1.15E-04	1.33E-04	4.89E-05	4.15E-05	8.31E-05	0.0002	0.00	**9.4**	**0.52**	**6**	**10.6**	**11.3**	**1.3E-04**	**4.6E+01**	**4.9E-05**	
9.7	0.2	9.595	0.53	33.6	64	2E+06	0.98	1.19E-04	1.33E-04	5.44E-05	4.63E-05	9.25E-05	0.0002	0.00	**9.5**	**0.53**	**6**	**10.8**	**11.3**	**1.3E-04**	**4.7E+01**	**5.4E-05**	
9.8	0.2	9.76	0.54	33.7	65	2E+06	0.9796	1.20E-04	1.33E-04	5.42E-05	4.60E-05	9.21E-05	0.0002	0.00	**9.7**	**0.54**	**6**	**10.8**	**11.3**	**1.3E-04**	**4.8E+01**	**5.4E-05**	
10.0	0.2	9.925	0.55	33.1	64	2E+06	0.9793	1.22E-04	1.33E-04	5.56E-05	4.73E-05	9.46E-05	0.0002	0.00	**9.8**	**0.55**	**7**	**10.9**	**11.3**	**1.3E-04**	**4.9E+01**	**5.6E-05**	
10.2	0.2	10.09	0.55	33.5	64	2E+06	0.9789	1.22E-04	1.33E-04	5.45E-05	4.63E-05	9.27E-05	0.0002	0.00	**10.0**	**0.55**	**7**	**10.9**	**11.3**	**1.3E-04**	**5.0E+01**	**5.5E-05**	
10.3	0.2	10.25	0.56	34.9	65	2E+06	0.9786	1.21E-04	1.33E-04	5.16E-05	4.39E-05	8.78E-05	0.0002	0.00	**10.2**	**0.56**	**7**	**10.8**	**11.3**	**1.3E-04**	**5.1E+01**	**5.2E-05**	
10.5	0.2	10.415	0.57	35.2	65	2E+06	0.9782	1.22E-04	1.33E-04	5.09E-05	4.33E-05	8.66E-05	0.0002	0.00	**10.3**	**0.57**	**7**	**10.9**	**11.3**	**1.3E-04**	**5.2E+01**	**5.1E-05**	
10.7	0.2	10.58	0.58	34.4	65	2E+06	0.9779	1.24E-04	1.33E-04	5.26E-05	4.47E-05	8.95E-05	0.0002	0.00	**10.5**	**0.58**	**7**	**10.9**	**11.3**	**1.3E-04**	**5.3E+01**	**5.3E-05**	
10.8	0.2	10.745	0.59	34.6	65	2E+06	0.9775	1.24E-04	1.33E-04	5.21E-05	4.43E-05	8.86E-05	0.0002	0.00	**10.7**	**0.59**	**7**	**11.0**	**11.3**	**1.3E-04**	**5.4E+01**	**5.2E-05**	
11.0	0.2	10.91	0.60	34.5	65	2E+06	0.9772	1.26E-04	1.33E-04	5.23E-05	4.45E-05	8.90E-05	0.0002	0.00	**10.8**	**0.60**	**7**	**11.0**	**11.3**	**1.3E-04**	**5.5E+01**	**5.2E-05**	
11.2	0.2	11.07	0.61	36.4	66	2E+06	0.9769	1.24E-04	1.33E-04	4.89E-05	4.16E-05	8.31E-05	0.0002	0.00	**11.0**	**0.61**	**7**	**10.9**	**11.3**	**1.3E-04**	**5.6E+01**	**4.9E-05**	
11.3	0.2	11.235	0.62	38.0	67	2E+06	0.9765	1.23E-04	1.33E-04	4.65E-05	3.95E-05	7.90E-05	0.0002	0.00	**11.2**	**0.62**	**7**	**10.9**	**11.3**	**1.3E-04**	**5.7E+01**	**4.6E-05**	
11.5	0.2	11.4	0.63	39.5	68	2E+06	0.9762	1.23E-04	1.33E-04	4.46E-05	3.79E-05	7.59E-05	0.0001	0.00	**11.3**	**0.63**	**7**	**10.9**	**11.3**	**1.3E-04**	**5.8E+01**	**4.5E-05**	
11.7	0.2	11.565	0.64	39.6	68	2E+06	0.9758	1.23E-04	1.33E-04	4.46E-05	3.79E-05	7.57E-05	0.0002	0.00	**11.5**	**0.64**	**7**	**10.9**	**11.3**	**1.3E-04**	**5.9E+01**	**4.5E-05**	
11.8	0.2	11.73	0.65	37.3	67	2E+06	0.9755	1.27E-04	1.33E-04	4.75E-05	4.03E-05	8.07E-05	0.0002	0.00	**11.7**	**0.65**	**7**	**11.0**	**11.3**	**1.3E-04**	**6.0E+01**	**4.7E-05**	
12.0	0.2	11.895	0.65	35.6	66	2E+06	0.9751	1.29E-04	1.33E-04	5.02E-05	4.27E-05	8.53E-05	0.0002	0.00	**11.8**	**0.65**	**7**	**11.1**	**11.3**	**1.3E-04**	**6.1E+01**	**5.0E-05**	
12.1	0.2	12.06	0.66	34.5	65	2E+06	0.9748	1.32E-04	1.29E-04	5.06E-05	4.30E-05	8.60E-05	0.0002	0.00	**12.0**	**0.66**	**7**	**11.2**	**11.1**	**1.3E-04**	**6.2E+01**	**5.1E-05**	
12.3	0.2	12.22	0.67	35.4	66	2E+06	0.9744	1.31E-04	1.29E-04	4.90E-05	4.17E-05	8.33E-05	0.0002	0.00	**12.1**	**0.67**	**7**	**11.2**	**11.1**	**1.3E-04**	**6.3E+01**	**4.9E-05**	
12.5	0.2	12.385	0.68	35.3	66	2E+06	0.9741	1.32E-04	1.29E-04	4.91E-05	4.17E-05	8.34E-05	0.0002	0.00	**12.3**	**0.68**	**7**	**11.2**	**11.1**	**1.3E-04**	**6.4E+01**	**4.9E-05**	
12.6	0.2	12.55	0.69	35.9	66	2E+06	0.9737	1.32E-04	1.29E-04	4.80E-05	4.08E-05	8.17E-05	0.0002	0.00	**12.5**	**0.69**	**7**	**11.2**	**11.1**	**1.3E-04**	**6.5E+01**	**4.8E-05**	
12.8	0.2	12.715	0.70	36.8	66	2E+06	0.9734	1.32E-04	1.29E-04	4.66E-05	3.96E-05	7.93E-05	0.0002	0.00	**12.6**	**0.70**	**7**	**11.2**	**11.1**	**1.3E-04**	**6.6E+01**	**4.7E-05**	
13.0	0.2	12.88	0.71	36.5	66	2E+06	0.973	1.33E-04	1.29E-04	4.71E-05	4.00E-05	8.01E-05	0.0002	0.00	**12.8**	**0.71**	**7**	**11.2**	**11.1**	**1.3E-04**	**6.7E+01**	**4.7E-05**	
13.1	0.2	13.04	0.72	37.2	67	3E+06	0.9727	1.33E-04	1.29E-04	4.60E-05	3.91E-05	7.81E-05	0.0001	0.00	**13.0**	**0.72**	**7**	**11.2**	**11.1**	**1.3E-04**	**6.8E+01**	**4.6E-05**	
13.3	0.2	13.205	0.73	36.4	66	3E+06	0.9724	1.35E-04	1.29E-04	4.73E-05	4.02E-05	8.04E-05	0.0002	0.00	**13.1**	**0.73**	**7**	**11.3**	**11.1**	**1.3E-04**	**6.9E+01**	**4.7E-05**	
13.5	0.2	13.37	0.74	34.9	65	3E+06	0.972	1.38E-04	1.29E-04	5.00E-05	4.25E-05	8.49E-05	0.0002	0.00	**13.3**	**0.74**	**7**	**11.4**	**11.1**	**1.3E-04**	**7.0E+01**	**5.0E-05**	
13.6	0.2	13.535	0.74	35.4	66	3E+06	0.9717	1.38E-04	1.29E-04	4.89E-05	4.16E-05	8.31E-05	0.0002	0.00	**13.5**	**0.74**	**7**	**11.4**	**11.1**	**1.3E-04**	**7.1E+01**	**4.9E-05**	
13.8	0.2	13.7	0.75	34.9	65	3E+06	0.9713	1.39E-04	1.29E-04	4.99E-05	4.24E-05	8.48E-05	0.0002	0.00	**13.6**	**0.75**	**7**	**11.4**	**11.1**	**1.3E-04**	**7.2E+01**	**5.0E-05**	
13.9	0.2	13.86	0.76	34.7	65	3E+06	0.971	1.40E-04	1.29E-04	5.02E-05	4.27E-05	8.54E-05	0.0002	0.00	**13.8**	**0.76**	**7**	**11.5**	**11.1**	**1.3E-04**	**7.3E+01**	**5.0E-05**	
14.1	0.2	14.025	0.77	32.8	64	3E+06	0.9706	1.44E-04	2.11E-04	8.93E-05	7.59E-05	1.52E-04	0.0003	0.00	**13.9**	**0.77**	**7**	**11.6**	**13.2**	**2.1E-04**	**7.4E+01**	**8.9E-05**	
14.3	0.2													0.00									

seismic Settlement (inch)

col No	1	2	3	4	5	6	7	8	9	10	11	12
overburden		0.1 tsf		0.2 tsf		0.5 tsf		1 tsf		2 tsf		4 tsf
		0.1	0.14	0.2	0.32	0.5	0.7	1	1.4	2	2.7	4
	-0.06	-0.07	-0.071	-0.07	-0.071	-0.07	-0.036	0.00	3E-15	0.00	3E-15	0.00
	2.97	3.17	3.173	3.17	3.21	3.25	3.21	3.17	3.2456	3.32	3.3188	3.32
	4.71	5.12	5.123	5.12	5.1581	5.19	5.1581	5.12	5.1581	5.19	5.1938	5.19
	6.01	6.85	6.78	6.71	6.7088	6.71	6.6	6.49	6.4913	6.49	6.4913	6.49
	6.94	8.15	8.004	7.86	7.8244	7.79	7.68	7.57	7.6088	7.65	7.6463	7.65
	7.74	9.23	9.053	8.87	8.835	8.80	8.6531	8.51	8.4731	8.44	8.4375	8.44
	9.00	11.25	10.88	10.50	10.3	10.10	10.05	10.00	10	10.00	10	10.00
	9.91	12.91	12.37	11.83	11.539	11.25	11.106	10.96	10.817	10.67	10.673	10.67
	11.50	17.00	15.9	14.80	14.143	13.49	13.243	13.00	12.75	12.50	12.5	12.50
	13.00	24.59	21.49	18.39	17.164	15.94	15.36	14.78	14.531	14.28	14.279	14.28
	13.30	29.86	24.43	19.00	17.75	16.50	16.05	15.60	15.3	15.00	14.996	14.99
	14.68		33	26.18	22.933	19.69	18.679	17.67	17.201	16.73	16.652	16.57
	15.00			29.78	25.457	21.13	19.869	18.61	17.804	17.00	16.878	16.76
	16.04				28	24.59	22.573	20.55	19.796	19.04	18.693	18.35
	16.97					29.86	26.683	23.51	22.284	21.06	20.363	19.67
	17.65						28	26.32	24.555	22.79	21.724	20.66
	18.39							30.00	27.512	25.02	23.427	21.83
	18.95								30	27.12	25.022	22.93
	19.57									29.93	27.173	24.42
	21											30



N-SPT	**A-intercept**
5	32.5
10	36
15	38.5
20	40
30	42.5
40	45



a_{max} = 0.374

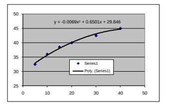
C.314.41.00 KAISER LAKE FOREST MOB

SEISMIC SETTLEMENT OF DRY SAND AT CPT04

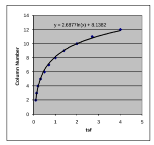
USING EQUIVALENT SPT ANALYSIS (Tokimatsu and Seed, 1987)

Depth of layer base(ft)	Layer thickness (ft)	Average layer depth (ft)	avg layer stress (tsf)	(N1-60)cs	K2-max	G-max	r-d	gama-e*(G-e/G-m)	gamma-e-calculated	epsln-c (M=7.5)-calculated	epsln-c (M=6.8)	2*epsln-c (M=6.8)	settlement (in)	Cumulative settlement (inch)	Depth (ft) of top of layer	sig-v tsf	column Number	x	y	gamma-e-calculated	gamma-e-read from curve	epsilon-c-calculated	epsilon-c-read off curve	seismic Settlement (inch)
0.2	0.2	0.089	0.00	10.2	43	135638	1.0007	1.76E-05	9.84E-06	2.61E-05	2.22E-05	4.44E-05	0.0001	0.47	0.0	0.00	6	2.4	-0.1	9.8E-06	-1.1E+01	2.6E-05		
0.3	0.2	0.246	0.01	15.3	50	258077	1.0007	2.55E-05	2.08E-05	3.16E-05	2.69E-05	5.37E-05	0.0001	0.47	0.2	0.01	3	4.1	3.2	2.1E-05	-1.0E+01	3.2E-05		
0.5	0.2	0.41	0.02	18.7	53	356200	1.0006	3.08E-05	3.25E-05	3.58E-05	3.04E-05	6.08E-05	0.0001	0.47	0.3	0.02	2	4.9	5.1	3.3E-05	-9.0E+00	3.6E-05		
0.7	0.2	0.574	0.03	18.7	53	421464	1.0003	3.64E-05	2.96E-05	3.25E-05	2.76E-05	5.53E-05	0.0001	0.47	0.5	0.03	1	5.6	4.7	3.0E-05	-8.0E+00	3.3E-05		
0.8	0.2	0.738	0.04	18.7	53	477896	1.0001	4.13E-05	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0.47	0.7	0.04	0	6.2	######	#VALUE!	-7.0E+00	#VALUE!		
1.0	0.2	0.902	0.05	18.7	53	528334	0.9997	4.57E-05	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0.47	0.8	0.05	0	6.6	######	#VALUE!	-6.0E+00	#VALUE!		
1.1	0.2	1.066	0.06	18.7	53	574359	0.9994	4.96E-05	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0.47	1.0	0.06	1	7.0	######	#VALUE!	-5.0E+00	#VALUE!		
1.3	0.2	1.23	0.07	19.4	54	624487	0.9991	5.26E-05	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0.47	1.1	0.07	1	7.2	######	#VALUE!	-4.0E+00	#VALUE!		
1.5	0.2	1.394	0.08	22.1	56	694376	0.9987	5.36E-05	4.94E-05	4.07E-05	3.46E-05	6.92E-05	0.0001	0.08	1.3	0.08	1	7.3	6.9	4.9E-05	-3.0E+00	4.1E-05		
1.6	0.2	1.558	0.09	23.8	57	752427	0.9983	5.53E-05	4.94E-05	3.57E-05	3.04E-05	6.07E-05	0.0001	0.08	1.5	0.09	2	7.4	6.9	4.9E-05	-2.0E+00	3.6E-05		
1.8	0.2	1.722	0.09	27.2	60	827007	0.998	5.56E-05	4.94E-05	2.83E-05	2.40E-05	4.81E-05	0.0001	0.08	1.6	0.09	2	7.4	6.9	4.9E-05	-1.0E+00	2.8E-05		
2.0	0.5	1.719	0.09	28.8	61	841964	0.998	5.45E-05	4.94E-05	2.57E-05	2.18E-05	4.36E-05	0.0003	0.08	1.5	0.09	2	7.4	6.9	4.9E-05	4.0E-03	2.6E-05		
2.1	0.2	2.051	0.11	28.6	61	917556	0.9972	5.96E-05	8.38E-05	4.41E-05	3.74E-05	7.49E-05	0.0001	0.08	2.0	0.11	2	7.8	9.2	8.4E-05	1.0E+00	4.4E-05		
2.3	0.2	2.215	0.12	30.1	62	969629	0.9968	6.09E-05	8.38E-05	4.05E-05	3.45E-05	6.89E-05	0.0001	0.08	2.1	0.12	2	7.8	9.2	8.4E-05	2.0E+00	4.1E-05		
2.5	0.2	2.379	0.13	31.5	63	1E+06	0.9964	6.21E-05	8.38E-05	3.76E-05	3.20E-05	6.39E-05	0.0001	0.08	2.3	0.13	3	7.9	9.2	8.4E-05	3.0E+00	3.8E-05		
2.6	0.2	2.543	0.14	31.3	63	1E+06	0.996	6.43E-05	8.38E-05	3.80E-05	3.23E-05	6.47E-05	0.0001	0.08	2.5	0.14	3	8.1	9.2	8.4E-05	4.0E+00	3.8E-05		
2.8	0.2	2.707	0.15	31.1	63	1E+06	0.9957	6.65E-05	8.04E-05	3.69E-05	3.14E-05	6.27E-05	0.0001	0.08	2.6	0.15	3	8.2	9.1	8.0E-05	5.0E+00	3.7E-05		
3.0	0.2	2.871	0.16	29.2	62	1E+06	0.9953	6.99E-05	8.04E-05	4.07E-05	3.46E-05	6.93E-05	0.0001	0.08	2.8	0.16	3	8.4	9.1	8.0E-05	6.0E+00	4.1E-05		
3.1	0.2	3.035	0.17	27.4	60	1E+06	0.9949	7.33E-05	8.04E-05	4.54E-05	3.86E-05	7.71E-05	0.0002	0.08	3.0	0.17	3	8.7	9.1	8.0E-05	7.0E+00	4.5E-05		
3.3	0.2	3.199	0.18	25.7	59	1E+06	0.9945	7.70E-05	8.04E-05	5.10E-05	4.33E-05	8.66E-05	0.0002	0.08	3.1	0.18	3	8.9	9.1	8.0E-05	8.0E+00	5.1E-05		
3.4	0.2	3.363	0.18	25.5	59	1E+06	0.9941	7.91E-05	8.04E-05	5.16E-05	4.38E-05	8.76E-05	0.0002	0.08	3.3	0.18	4	9.0	9.1	8.0E-05	9.0E+00	5.2E-05		
3.6	0.2	3.527	0.19	25.7	59	1E+06	0.9937	8.07E-05	1.22E-04	7.71E-05	6.56E-05	1.31E-04	0.0003	0.08	3.4	0.19	4	9.1	10.9	1.2E-04	1.0E+01	7.7E-05		
3.8	0.2	3.691	0.20	28.1	61	1E+06	0.9933	8.01E-05	1.22E-04	6.64E-05	5.64E-05	1.13E-04	0.0002	0.08	3.6	0.20	4	9.0	10.9	1.2E-04	1.1E+01	6.6E-05		
3.9	0.2	3.855	0.21	32.3	64	1E+06	0.9929	7.81E-05	8.04E-05	3.48E-05	2.95E-05	5.91E-05	0.0001	0.08	3.8	0.21	4	8.9	9.1	8.0E-05	1.2E+01	3.5E-05		
4.1	0.2	4.019	0.22	32.8	64	1E+06	0.9925	7.94E-05	7.71E-05	3.26E-05	2.77E-05	5.55E-05	0.0001	0.08	3.9	0.22	4	9.0	8.9	7.7E-05	1.3E+01	3.3E-05		
4.3	0.2	4.183	0.23	31.9	63	1E+06	0.9921	8.17E-05	1.12E-04	4.94E-05	4.20E-05	8.40E-05	0.0002	0.08	4.1	0.23	4	9.1	10.5	1.1E-04	1.4E+01	4.9E-05		
4.4	0.2	4.347	0.24	31.8	63	1E+06	0.9918	8.33E-05	1.12E-04	4.97E-05	4.23E-05	8.45E-05	0.0002	0.08	4.3	0.24	4	9.2	10.5	1.1E-04	1.5E+01	5.0E-05		
4.6	0.2	4.511	0.25	30.2	62	1E+06	0.9914	8.63E-05	1.12E-04	5.39E-05	4.58E-05	9.16E-05	0.0002	0.08	4.4	0.25	4	9.4	10.5	1.1E-04	1.6E+01	5.4E-05		
4.8	0.2	4.675	0.26	30.9	63	1E+06	0.991	8.71E-05	1.12E-04	5.20E-05	4.42E-05	8.83E-05	0.0002	0.08	4.6	0.26	4	9.4	10.5	1.1E-04	1.7E+01	5.2E-05		
4.9	0.2	4.839	0.27	31.3	63	1E+06	0.9906	8.83E-05	1.12E-04	5.10E-05	4.33E-05	8.66E-05	0.0002	0.08	4.8	0.27	5	9.5	10.5	1.1E-04	1.8E+01	5.1E-05		
5.1	0.2	5.003	0.28	32.0	63	1E+06	0.9902	8.90E-05	1.12E-04	4.91E-05	4.18E-05	8.35E-05	0.0002	0.08	4.9	0.28	5	9.5	10.5	1.1E-04	1.9E+01	4.9E-05		
5.2	0.2	5.167	0.28	33.0	64	2E+06	0.9898	8.96E-05	1.12E-04	4.71E-05	4.00E-05	8.00E-05	0.0002	0.08	5.1	0.28	5	9.5	10.5	1.1E-04	2.0E+01	4.7E-05		
5.4	0.2	5.331	0.29	32.8	64	2E+06	0.9895	9.11E-05	1.12E-04	4.75E-05	4.04E-05	8.07E-05	0.0002	0.08	5.2	0.29	5	9.6	10.5	1.1E-04	2.1E+01	4.7E-05		
5.6	0.2	5.495	0.30	33.7	65	2E+06	0.9891	9.16E-05	1.12E-04	4.56E-05	3.87E-05	7.75E-05	0.0002	0.08	5.4	0.30	5	9.6	10.5	1.1E-04	2.2E+01	4.6E-05		
5.7	0.2	5.659	0.31	33.4	64	2E+06	0.9887	9.33E-05	1.07E-04	4.41E-05	3.75E-05	7.50E-05	0.0001	0.08	5.6	0.31	5	9.7	10.3	1.1E-04	2.3E+01	4.4E-05		
5.9	0.2	5.823	0.32	33.3	64	2E+06	0.9883	9.46E-05	1.07E-04	4.43E-05	3.76E-05	7.53E-05	0.0001	0.08	5.7	0.32	5	9.8	10.3	1.1E-04	2.4E+01	4.4E-05		
6.1	0.2	5.988	0.33	33.2	64	2E+06	0.988	9.60E-05	1.07E-04	4.44E-05	3.78E-05	7.55E-05	0.0001	0.08	5.9	0.33	5	9.8	10.3	1.1E-04	2.5E+01	4.4E-05		
6.2	0.2	6.152	0.34	32.1	64	2E+06	0.9876	9.83E-05	1.43E-04	6.21E-05	5.28E-05	1.06E-04	0.0002	0.08	6.1	0.34	5	9.9	11.5	1.4E-04	2.6E+01	6.2E-05		
6.4	0.2	6.316	0.35	33.1	64	2E+06	0.9872	9.86E-05	1.43E-04	5.93E-05	5.04E-05	1.01E-04	0.0002	0.08	6.2	0.35	5	9.9	11.5	1.4E-04	2.7E+01	5.9E-05		
6.6	0.2	6.48	0.36	32.6	64	2E+06	0.9868	1.00E-04	1.43E-04	6.07E-05	5.16E-05	1.03E-04	0.0002	0.08	6.4	0.36	5	10.0	11.5	1.4E-04	2.8E+01	6.1E-05		
6.7	0.2	6.644	0.37	32.8	64	2E+06	0.9865	1.01E-04	1.43E-04	6.01E-05	5.11E-05	1.02E-04	0.0002	0.08	6.6	0.37	5	10.1	11.5	1.4E-04	2.9E+01	6.0E-05		
6.9	0.2	6.808	0.37	31.8	63	2E+06	0.9861	1.04E-04	1.43E-04	6.30E-05	5.36E-05	1.07E-04	0.0002	0.08	6.7	0.37	5	10.2	11.5	1.4E-04	3.0E+01	6.3E-05		
7.1	0.2	6.972	0.38	31.4	63	2E+06	0.9857	1.05E-04	1.43E-04	6.42E-05	5.46E-05	1.09E-04	0.0002	0.08	6.9	0.38	6	10.2	11.5	1.4E-04	3.1E+01	6.4E-05		
7.2	0.2	7.136	0.39	31.8	63	2E+06	0.9854	1.06E-04	1.43E-04	6.31E-05	5.37E-05	1.07E-04	0.0002	0.08	7.1	0.39	6	10.3	11.5	1.4E-04	3.2E+01	6.3E-05		
7.4	0.2	7.3	0.40	33.4	64	2E+06	0.985	1.05E-04	1.43E-04	5.85E-05	4.98E-05	9.95E-05	0.0002	0.08	7.2	0.40	6	10.2	11.5	1.4E-04	3.3E+01	5.9E-05		
7.5	0.2	7.464	0.41	35.1	65	2E+06	0.9846	1.05E-04	1.43E-04	5.47E-05	4.65E-05	9.29E-05	0.0002	0.07	7.4	0.41	6	10.2	11.5	1.4E-04	3.4E+01	5.5E-05		
7.7	0.2	7.628	0.42	34.3	65	2E+06	0.9843	1.07E-04	1.43E-04	5.64E-05	4.79E-05	9.58E-05	0.0002	0.07	7.5	0.42	6	10.3	11.5	1.4E-04	3.5E+01	5.6E-05		
7.9	0.2	7.792	0.43	34.7	65	2E+06	0.9839	1.07E-04	1.43E-04	5.55E-05	4.72E-05	9.44E-05	0.0002	0.07	7.7	0.43	6	10.3	11.5	1.4E-04	3.6E+01	5.6E-05		
8.0	0.2	7.956	0.44	34.8	65	2E+06	0.9835	1.08E-04	1.43E-04	5.53E-05	4.70E-05	9.40E-05	0.0002	0.07	7.9	0.44	6	10.4	11.5	1.4E-04	3.7E+01	5.5E-05		
8.2	0.2	8.12	0.45	35.3	66	2E+06	0.9832	1.09E-04	1.43E-04	5.43E-05	4.61E-05	9.22E-05	0.0002	0.07	8.0	0.45	6	10.4	11.5	1.4E-04	3.8E+01	5.4E-05		
8.4	0.2	8.284	0.46	34.0	65	2E+06	0.9828	1.11E-04	1.33E-04	5.34E-05	4.54E-05	9.08E-05	0.0002	0.07	8.2	0.46	6	10.5	11.3	1.3E-04	3.9E+01	5.3E-05		
8.5	0.2	8.448	0.46	31.1	63	2E+06	0.9825	1.16E-04	1.33E-04	6.12E-05	5.20E-05	1.04E-04	0.0002	0.07	8.4	0.46	6	10.6	11.3	1.3E-04	4.0E+01	6.1E-05		
8.7	0.2	8.612	0.47	29.8	62	2E+06	0.9821	1.19E-04	1.33E-04	6.53E-05	5.55E-05	1.11E-04	0.0002	0.07	8.5	0.47	6	10.7	11.3	1.3E-04	4.1E+01	6.5E-05		
8.9	0.2	8.776	0.48	30.5	62	2E+06	0.9818	1.19E-04	1.33E-04	6.31E-05	5.36E-05	1.07E-04	0.0002	0.07	8.7	0.48	6	10.7	11.3	1.3E-04	4.2E+01	6.3E-05		
9.0	0.2	8.94	0.49	31.4	63	2E+06	0.9814	1.19E-04	1.33E-04	6.02E-05	5.12E-05	1.02E-04	0.0002	0.07	8.9	0.49	6	10.7	11.3	1.3E-04	4.3E+01	6.0E-05		
9.2	0.2	9.104	0.50	32.1	63	2E+06	0.981	1.19E-04	1.33E-04	5.82E-05	4.95E-05	9.89E-05	0.0002	0.07	9.0	0.50	6	10.8	11.3	1.3E-04	4.4E+01	5.8E-05		
9.4	0.2	9.268	0.51	29.7	62	2E+06	0.9807	1.23E-04	1.33E-04	6.59E-05	5.60E-05	1.12E-04	0.0002	0.07	9.2	0.51	6	10.9	11.3	1.3E-04	4.5E+01	6.6E-05		
9.5	0.2	9.432	0.52	29.5	62	2E+06	0.9803	1.24E-04	1.33E-04	6.64E-05	5.65E-05	1.13E-04	0.0002	0.07	9.4	0.52	6	10.9	11.3	1.3E-04	4.6E+01	6.6E-05		
9.7	0.2	9.596	0.53	28.9	61	2E+06	0.98	1.26E-04	1.33E-04	6.88E-05	5.85E-05	1.17E-04	0.0002	0.07	9.5	0.53	6	11.0	11.3	1.3E-04	4.7E+01	6.9E-05		
9.8	0.2	9.76	0.54	29.1	61	2E+06	0.9796	1.27E-04	1.33E-04	6.80E-05	5.78E-05	1.16E-04	0.0002	0.07	9.7	0.54	6	11.0	11.3	1.3E-04	4.8E+01	6.8E-05		
10.0	0.2	9.925	0.55	27.8	61	2E+06	0.9793	1.30E-04	1.33E-04	7.35E-05	6.25E-05	1.25E-04	0.0002	0.07	9.8	0.55	7	11.1	11.3	1.3E-04	4.9E+01	7.4E-05		
10.2	0.2	10.09	0.55	27.4	60	2E+06	0.9789	1.32E-04	1.33E-04	7.56E-05	6.42E-05	1.28E-04	0.0003	0.07	10.0	0.55	7	11.2	11.3	1.3E-04	5.0E+01	7.6E-05		
10.3	0.2	10.25	0.56	28.7	61	2E+06	0.9786	1.31E-04	1.33E-04	6.95E-05	5.91E-05	1.18E-04	0.0002	0.07	10.2	0.56	7	11.2	11.3	1.3E-04	5.1E+01	7.0E-05		
10.5	0.2	10.42	0.57	31.6	63	2E+06	0.9782	1.27E-04	1.33E-04	5.96E-05	5.07E-05	1.01E-04	0.0002	0.07	10.3	0.57	7	11.1	11.3	1.3E-04	5.2E+01	6.0E-05		
10.7	0.2	10.58	0.58	34.1	65	2E+06	0.9779	1.25E-04	1.33E-04	5.31E-05	4.52E-05	9.03E-05	0.0002	0.07	10.5	0.58	7	11.0	11.3	1.3E-04	5.3E+01	5.3E-05		
10.8	0.2	10.74	0.59	33.7	65	2E+06	0.9775	1.27E-04	1.33E-04	5.41E-05	4.60E-05	9.20E-05	0.0002	0.07	10.7	0.59	7	11.0	11.3	1.3E-04	5.4E+01	5.4E-05		
11.0	0.2	10.91	0.60	34.9	65	2E+06	0.9772	1.26E-04	1.33E-04	5.15E-05	4.38E-05	8.75E-05	0.0002	0.07	10.8	0.60	7	11.0	11.3	1.3E-04	5.5E+01	5.1E-05		
11.2	0.2	11.07	0.61	35.8	66	2E+06	0.9769	1.26E-04	1.33E-04	4.98E-05	4.23E-05	8.46E-05	0.0002	0.07	11.0	0.61	7	11.0	11.3	1.3E-04	5.6E+01	5.0E-05		
11.3	0.2	11.24	0.62	35.4	66	2E+06	0.9765	1.27E-04	1.33E-04	5.05E-05	4.30E-05	8.59E-05	0.0002	0.07	11.2	0.62	7	11.0	11.3	1.3E-04	5.7E+01	5.1E-05		
11.5	0.2	11.4	0.63	34.0	65	2E+06	0.9762	1.30E-04	1.33E-04	5.34E-05	4.54E-05	9.07E-05	0.0002	0.07	11.3	0.63	7	11.1	11.3	1.3E-04	5.8E+01	5.3E-05		
11.6	0.2	11.56	0.64	31.8	63	2E+06	0.9758	1.34E-04	1.33E-04	5.90E-05	5.02E-05	1.00E-04	0.0002	0.07	11.5	0.64	7	11.3	11.3	1.3E-04	5.9E+01	5.9E-05		
11.8	0.2	11.73	0.65	30.4	62	2E+06	0.9755	1.37E-04	1.33E-04	6.33E-05	5.38E-05	1.08E-04	0.0002	0.07	11.6	0.65	7	11.4	11.3	1.3E-04	6.0E+01	6.3E-05		
12.0	0.2	11.89	0.65	28.9	61	2E+06	0.9751	1.40E-04	1.33E-04	6.87E-05	5.84E-05	1.17E-04	0.0002	0.07	11.8	0.65	7	11.5	11.3	1.3E-04	6.1E+01	6.9E-05		
12.1	0.2	12.06	0.66	28.6	61	2E+06	0.9748	1.41E-04	2.11E-04	1.11E-04	9.43E-05	1.89E-04	0.0004	0.07	12.0	0.66	7	11.5	13.2	2.1E-04	6.2E+01	1.1E-04		
12.3	0.2	12.22	0.67	28.9	61	2E+06	0.9744	1.42E-04	2.11E-04	1.09E-04	9.28E-05	1.86E-04	0.0004	0.07	12.1	0.67	7	11.5	13.2	2.1E-04	6.3E+01	1.1E-04		
12.5	0.2	12.39	0.68	30.8	63	2E+06	0.9741	1.40E-04	1.29E-04	6.01E-05	5.11E-05	1.02E-04	0.0002	0.07	12.3	0.68	7	11.4	11.1	1.3E-04	6.4E+01	6.0E-05		
12.6	0.2	12.55	0.69	29.3	62	2E+06	0.9737	1.43E-04	2.11E-04	1.07E-04	9.06E-05	1.81E-04	0.0004	0.07	12.5	0.69	7	11.5	13.2	2.1E-04	6.5E+01	1.1E-04		
12.8	0.2	12.71	0.70	30.6	62	2E+06	0.9734	1.42E-04	2.11E-04	9.95E-05	8.46E-05	1.69E-04	0.0003	0.07	12.6	0.70	7	11.5	13.2	2.1E-04	6.6E+01	9.9E-05		
13.0	0.2	12.88	0.71	33.3	64	2E+06	0.9731	1.39E-04	1.29E-04	5.33E-05	4.53E-05	9.07E-05	0.0002	0.07	12.8	0.71	7	11.4	11.1	1.3E-04	6.7E+01	5.3E-05		
13.1	0.2	13.04	0.72	35.9	66	2E+06	0.9727	1.36E-04	1.29E-04	4.80E-05	4.08E-05	8.16E-05	0.0002	0.07	13.0	0.72	7	11.3	11.1	1.3E-04	6.8E+01	4.8E-05		
13.3	0.2	13.21	0.73	36.9	66	3E+06	0.9724	1.36E-04	1.29E-04	4.65E-05	3.95E-05	7.90E-05	0.0002	0.07	13.1	0.73	7	11.3	11.1	1.3E-04	6.9E+01	4.6E-05		
13.5	0.2	13.37	0.74	40.0	68	3E+06	0.972	1.33E-04	1.29E-04	4.27E-05	3.63E-05	7.26E-05	0.0001	0.07	13.3	0.74	7	11.2	11.1	1.3E-04	7.0E+01	4.3E-05		
13.6	0.2	13.53	0.74	40.6	69	3E+06	0.9717	1.33E-04	1.29E-04	4.21E-05	3.58E-05	7.15E-05	0.0001	0.07	13.5	0.74	7	11.2	11.1	1.3E-04	7.1E+01	4.2E-05		
13.8	0.2	13.7	0.75	40.1	68	3E+06	0.9713	1.34E-04	1.29E-04	4.25E-05	3.62E-05	7.23E-05	0.0001	0.07	13.6	0.75	7	11.3	11.1	1.3E-04	7.2E+01	4.3E-05		
13.9	0.2	13.86	0.76	38.4	67	3E+06	0.971	1.37E-04	1.29E-04	4.44E-05	3.77E-05	7.55E-05	0.0001	0.07	13.8	0.76	7	11.4	11.1	1.3E-04	7.3E+01	4.4E-05		
14.1	0.2	14.03	0.77	37.3	67	3E+06	0.9706	1.39E-04	1.29E-04	4.59E-05	3.90E-05	7.80E-05	0.0002	0.07	13.9	0.77	7	11.4	11.1	1.3E-04	7.4E+01	4.6E-05		
14.3	0.2	14.19	0.78	38.6	67	3E+06	0.9703	1.38E-04	1.29E-04	4.42E-05	3.76E-05	7.51E-05	0.0001	0.07	14.1	0.78	7	11.4	11.1	1.3E-04	7.5E+01	4.4E-05		
14.4	0.2	14.35	0.79	37.6	67	3E+06	0.9699	1.40E-04	1.29E-04	4.54E-05	3.86E-05	7.72E-05	0.0002	0.07	14.3	0.79	8	11.5	11.1	1.3E-04	7.6E+01	4.5E-05		
14.6	0.2	14.52	0.80	34.6	65	3E+06	0.9696	1.45E-04	2.11E-04	8.27E-05	7.03E-05	1.41E-04	0.0003	0.07	14.4	0.80	8	11.6	13.2	2.1E-04	7.7E+01	8.3E-05		
14.8	0.2	14.68	0.81	35.2	65	3E+06	0.9692	1.45E-04	2.11E-04	8.07E-05	6.86E-05	1.37E-04	0.0003	0.07	14.6	0.81	8	11.6	13.2	2.1E-04	7.8E+01	8.1E-05		
14.9	0.2	14.85	0.82	38.3	67	3E+06	0.9689	1.41E-04	2.11E-04	7.28E-05	6.19E-05	1.24E-04	0.0002	0.07	14.8	0.82	8	11.5	13.2	2.1E-04	7.9E+01	7.3E-05		
15.1	0.2	15.01	0.83	40.0	68	3E+06	0.9685	1.40E-04	1.29E-04	4.27E-05	3.63E-05	7.26E-05	0.0001	0.07	14.9	0.83	8	11.5	11.1	1.3E-04	8.0E+01	4.3E-05		
15.3	0.2	15.17	0.83	37.5	67	3E+06	0.9682	1.44E-04	2.11E-04	7.45E-05	6.33E-05	1.27E-04	0.0002	0.07	15.1	0.83	8	11.6	13.2	2.1E-04	8.1E+01	7.4E-05		
15.4	0.2	15.34	0.84	36.1	66	3E+06	0.9678	1.46E-04	2.11E-04	7.82E-05	6.65E-05	1.33E-04	0.0003	0.06	15.3	0.84	8	11.7	13.2	2.1E-04	8.2E+01	7.8E-05		
15.6	0.2	15.5	0.85	34.4	65	3E+06	0.9674	1.50E-04	2.11E-04	8.33E-05	7.08E-05	1.42E-04	0.0003	0.06	15.4	0.85	8	11.7	13.2	2.1E-04	8.3E+01	8.3E-05		
15.7	0.2	15.67	0.86	33.0	64	3E+06	0.9671	1.52E-04	2.11E-04	8.81E-05	7.49E-05	1.50E-04	0.0003	0.06	15.6	0.86	8	11.8	13.2	2.1E-04	8.4E+01	8.8E-05		
15.9	0.2	15.83	0.87	33.4	64	3E+06	0.9667	1.53E-04	2.11E-04	8.70E-05	7.39E-05	1.48E-04	0.0003	0.06	15.7	0.87	8	11.8	13.2	2.1E-04	8.5E+01	8.7E-05		
16.1	0.2	15.99	0.88	35.1	65	3E+06	0.9664	1.51E-04	2.11E-04	8.11E-05	6.89E-05	1.38E-04	0.0003	0.06	15.9	0.88	8	11.8	13.2	2.1E-04	8.6E+01	8.1E-05		
16.2	0.2	16.16	0.89	33.2	64	3E+06	0.966	1.54E-04	2.11E-04	8.76E-05	7.45E-05	1.49E-04	0.0003	0.06	16.1	0.89	8	11.9	13.2	2.1E-04	8.7E+01	8.8E-05		
16.4	0.2	16.32	0.90	30.3	62	3E+06	0.9656	1.60E-04	2.11E-04	1.01E-04	8.55E-05	1.71E-04	0.0003	0.06	16.2	0.90	8	12.0	13.2	2.1E-04	8.8E+01	1.0E-04		
16.6	0.2	16.49	0.91	29.9	62	3E+06	0.9653	1.61E-04	2.11E-04	1.03E-04	8.78E-05	1.76E-04	0.0003	0.06	16.4	0.91	8	12.1	13.2	2.1E-04	8.9E+01	1.0E-04		
16.7	0.2	16.65	0.92	26.4	60	3E+06	0.9649	1.69E-04	2.11E-04	1.27E-04	1.08E-04	2.16E-04	0.0004	0.06	16.6	0.92	8	12.3	13.2	2.1E-04	9.0E+01	1.3E-04		
16.9	0.2	16.81	0.92	24.7	58	3E+06	0.9645	1.73E-04	2.11E-04	1.43E-04	1.22E-04	2.43E-04	0.0005	0.06	16.7	0.92	8	12.4	13.2	2.1E-04	9.1E+01	1.4E-04		
17.1	0.2	16.98	0.93	23.7	57	2E+06	0.9642	1.76E-04	2.11E-04	1.53E-04	1.30E-04	2.61E-04	0.0005	0.06	16.9	0.93	8	12.5	13.2	2.1E-04	9.2E+01	1.5E-04		
17.2	0.2	17.14	0.94	23.5	57	2E+06	0.9638	1.78E-04	2.11E-04	1.56E-04	1.32E-04	2.65E-04	0.0005	0.06	17.1	0.94	8	12.5	13.2	2.1E-04	9.3E+01	1.6E-04		
17.4	0.2	17.31	0.95	25.2	59	3E+06	0.9634	1.74E-04	2.00E-04	1.30E-04	1.11E-04	2.22E-04	0.0004	0.06	17.2	0.95	8	12.4	13.0	2.0E-04	9.4E+01	1.3E-04		
17.6	0.2	17.47	0.96	25.8	59	3E+06	0.963	1.74E-04	2.00E-04	1.25E-04	1.06E-04	2.12E-04	0.0004	0.06	17.4	0.96	8	12.4	13.0	2.0E-04	9.5E+01	1.2E-04		
17.7	0.2	17.63	0.97	25.6	59	3E+06	0.9627	1.75E-04	2.00E-04	1.27E-04	1.08E-04	2.15E-04	0.0004	0.06	17.6	0.97	8	12.4	13.0	2.0E-04	9.6E+01	1.3E-04		
17.9	0.2	17.8	0.98	27.5	60	3E+06	0.9623	1.72E-04	2.00E-04	1.12E-04	9.51E-05	1.90E-04	0.0004	0.06	17.7	0.98	8	12.3	13.0	2.0E-04	9.7E+01	1.1E-04		
18.0	0.2	17.96	0.99	29.0	61	3E+06	0.9619	1.69E-04	2.00E-04	1.02E-04	8.71E-05	1.74E-04	0.0003	0.06	17.9	0.99	8	12.3	13.0	2.0E-04	9.8E+01	1.0E-04		
18.2	0.2	18.13	1.00	30.9	63	3E+06	0.9615	1.66E-04	2.00E-04	9.23E-05	7.85E-05	1.57E-04	0.0003	0.06	18.0	1.00	8	12.2	13.0	2.0E-04	9.9E+01	9.2E-05		
18.4	0.2	18.29	1.01	32.7	64	3E+06	0.9611	1.64E-04	2.00E-04	8.48E-05	7.21E-05	1.44E-04	0.0003	0.06	18.2	1.01	8	12.2	13.0	2.0E-04	1.0E+02	8.5E-05		
18.5	0.2	18.45	1.02	35.8	66	3E+06	0.9607	1.60E-04	2.00E-04	7.46E-05	6.34E-05	1.27E-04	0.0003	0.06	18.4	1.02	8	12.0	13.0	2.0E-04	1.0E+02	7.5E-05		
18.7	0.2	18.62	1.02	36.3	66	3E+06	0.9603	1.60E-04	2.00E-04	7.34E-05	6.24E-05	1.25E-04	0.0002	0.06	18.5	1.02	8	12.0	13.0	2.0E-04	1.0E+02	7.3E-05		
18.9	0.2	18.78	1.03	36.2	66	3E+06	0.9599	1.60E-04	2.00E-04	7.35E-05	6.24E-05	1.25E-04	0.0002	0.06	18.7	1.03	8	12.1	13.0	2.0E-04	1.0E+02	7.3E-05		
19.0	0.2	18.95	1.04	34.6	65	3E+06	0.9595	1.64E-04	2.00E-04	7.81E-05	6.64E-05	1.33E-04	0.0003	0.06	18.9	1.04	8	12.1	13.0	2.0E-04	1.0E+02	7.8E-05		
19.2	0.2	19.11	1.05	34.0	65	3E+06	0.9591	1.65E-04	2.00E-04	8.00E-05	6.80E-05	1.36E-04	0.0003	0.06	19.0	1.05	8	12.2	13.0	2.0E-04	1.1E+02	8.0E-05		
19.4	0.2	19.27	1.06	34.9	65	3E+06	0.9587	1.64E-04	2.00E-04	7.72E-05	6.56E-05	1.31E-04	0.0003	0.06	19.2	1.06	8	12.2	13.0	2.0E-04	1.1E+02	7.7E-05		
19.5	0.2	19.44	1.07	34.9	65	3E+06	0.9583	1.65E-04	2.00E-04	7.73E-05	6.57E-05	1.31E-04	0.0003	0.06	19.4	1.07	8	12.2	13.0	2.0E-04	1.1E+02	7.7E-05		
19.7	0.2	19.6	1.08	34.4	65	3E+06	0.9579	1.66E-04	2.00E-04	7.87E-05	6.69E-05	1.34E-04	0.0003	0.06	19.5	1.08	8	12.2	13.0	2.0E-04	1.1E+02	7.9E-05		
19.8	0.2	19.77	1.09	35.3	65	3E+06	0.9575	1.66E-04	2.00E-04	7.61E-05	6.47E-05	1.29E-04	0.0003	0.06	19.7	1.09	8	12.2	13.0	2.0E-04	1.1E+02	7.6E-05		
20.0	0.2	19.93	1.10	37.1	67	3E+06	0.957	1.64E-04	2.00E-04	7.15E-05	6.07E-05	1.21E-04	0.0002	0.06	19.8	1.10	8	12.1	13.0	2.0E-04	1.1E+02	7.1E-05		
20.2	0.2	20.1	1.11	40.3	68	3E+06	0.9566	1.60E-04	2.00E-04	6.56E-05	5.57E-05	1.11E-04	0.0002	0.06	20.0	1.11	8	12.0	13.0	2.0E-04	1.1E+02	6.6E-05		
20.3	0.2	20.26	1.11	39.9	68	3E+06	0.9562	1.61E-04	2.00E-04	6.61E-05	5.62E-05	1.12E-04	0.0002	0.06	20.2	1.11	8	12.1	13.0	2.0E-04	1.1E+02	6.6E-05		
20.5	0.2	20.42	1.12	41.2	69	3E+06	0.9558	1.60E-04	2.00E-04	6.44E-05	5.48E-05	1.10E-04	0.0002	0.06	20.3	1.12	8	12.0	13.0	2.0E-04	1.1E+02	6.4E-05		
20.7	0.2	20.59	1.13	42.3	70	3E+06	0.9553	1.59E-04	2.00E-04	6.32E-05	5.37E-05	1.07E-04	0.0002	0.05	20.5	1.13	8	12.0	13.0	2.0E-04	1.1E+02	6.3E-05		
20.8	0.2	20.75	1.14	41.1	69	3E+06	0.9549	1.61E-04	2.00E-04	6.45E-05	5.48E-05	1.10E-04	0.0002	0.05	20.7	1.14	8	12.1	13.0	2.0E-04	1.2E+02	6.5E-05		
21.0	0.2	20.92	1.15	39.2	68	3E+06	0.9544	1.64E-04	2.00E-04	6.72E-05	5.71E-05	1.14E-04	0.0002	0.05	20.8	1.15	9	12.1	13.0	2.0E-04	1.2E+02	6.7E-05		
21.2	0.2	21.08	1.16	38.0	67	3E+06	0.954	1.66E-04	2.00E-04	6.94E-05	5.90E-05	1.18E-04	0.0002	0.05	21.0	1.16	9	12.2	13.0	2.0E-04	1.2E+02	6.9E-05		
21.3	0.2	21.24	1.17	36.1	66	3E+06	0.9535	1.70E-04	2.00E-04	7.37E-05	6.27E-05	1.25E-04	0.0002	0.05	21.2	1.17	9	12.3	13.0	2.0E-04	1.2E+02	7.4E-05		
21.5	0.2	21.41	1.18	36.0	66	3E+06	0.9531	1.70E-04	2.00E-04	7.40E-05	6.29E-05	1.26E-04	0.0002	0.05	21.3	1.18	9	12.3	13.0	2.0E-04	1.2E+02	7.4E-05		
21.7	0.2	21.57	1.19	35.2	65	3E+06	0.9526	1.72E-04	2.00E-04	7.63E-05	6.49E-05	1.30E-04	0.0003	0.05	21.5	1.19	9	12.4	13.0	2.0E-04	1.2E+02	7.6E-05		
21.8	0.2	21.74	1.20	34.2	65	3E+06	0.9521	1.75E-04	2.00E-04	7.94E-05	6.75E-05	1.35E-04	0.0003	0.05	21.7	1.20	9	12.4	13.0	2.0E-04	1.2E+02	7.9E-05		
22.0	0.2	21.9	1.20	33.8	65	3E+06	0.9517	1.76E-04	2.00E-04	8.07E-05	6.86E-05	1.37E-04	0.0003	0.05	21.8	1.20	9	12.5	13.0	2.0E-04	1.2E+02	8.1E-05		
22.1	0.2	22.06	1.21	33.8	65	3E+06	0.9512	1.76E-04	2.00E-04	8.08E-05	6.87E-05	1.37E-04	0.0003	0.05	22.0	1.21	9	12.5	13.0	2.0E-04	1.2E+02	8.1E-05		
22.3	0.2	22.23	1.22	34.5	65	3E+06	0.9507	1.76E-04	2.00E-04	7.84E-05	6.66E-05	1.33E-04	0.0003	0.05	22.1	1.22	9	12.4	13.0	2.0E-04	1.2E+02	7.8E-05		
22.5	0.2	22.39	1.23	35.3	66	3E+06	0.9502	1.75E-04	2.00E-04	7.60E-05	6.46E-05	1.29E-04	0.0003	0.05	22.3	1.23	9	12.4	13.0	2.0E-04	1.3E+02	7.6E-05		
22.6	0.2	22.56	1.24	34.2	65	3E+06	0.9497	1.77E-04	2.00E-04	7.93E-05	6.74E-05	1.35E-04	0.0003	0.05	22.5	1.24	9	12.5	13.0	2.0E-04	1.3E+02	7.9E-05		
22.8	0.2	22.72	1.25	34.5	65	3E+06	0.9493	1.77E-04	2.00E-04	7.85E-05	6.67E-05	1.33E-04	0.0003	0.05	22.6	1.25	9	12.5	13.0	2.0E-04	1.3E+02	7.9E-05		
23.0	0.2	22.88	1.26	33.8	65	3E+06	0.9488	1.79E-04	2.00E-04	8.07E-05	6.86E-05	1.37E-04	0.0003	0.05	22.8	1.26	9	12.5	13.0	2.0E-04	1.3E+02	8.1E-05		
23.1	0.2	23.05	1.27	31.0	63	3E+06	0.9482	1.85E-04	2.00E-04	9.17E-05	7.80E-05	1.56E-04	0.0003	0.05	23.0	1.27	9	12.7	13.0	2.0E-04	1.3E+02	9.2E-05		
23.3	0.2	23.21	1.28	27.9	61	3E+06	0.9477	1.92E-04	2.00E-04	1.10E-04	9.33E-05	1.87E-04	0.0004	0.05	23.1	1.28	9	12.8	13.0	2.0E-04	1.3E+02	1.1E-04		
23.5	0.2	23.38	1.29	27.4	60	3E+06	0.9472	1.94E-04	2.00E-04	1.12E-04	9.56E-05	1.91E-04	0.0004	0.05	23.3	1.29	9	12.9	13.0	2.0E-04	1.3E+02	1.1E-04		
23.6	0.2	23.54	1.29	28.3	61	3E+06	0.9467	1.92E-04	2.00E-04	1.07E-04	9.09E-05	1.82E-04	0.0004	0.05	23.5	1.29	9	12.8	13.0	2.0E-04	1.3E+02	1.1E-04		
23.8	0.2	23.7	1.30	28.2	61	3E+06	0.9462	1.93E-04	2.00E-04	1.08E-04	9.14E-05	1.83E-04	0.0004	0.05	23.6	1.30	9	12.9	13.0	2.0E-04	1.3E+02	1.1E-04		
24.0	0.2	23.87	1.31	26.3	59	3E+06	0.9456	1.98E-04	2.00E-04	1.21E-04	1.03E-04	2.06E-04	0.0004	0.05	23.8	1.31	9	13.0	13.0	2.0E-04	1.3E+02	1.2E-04		
24.1	0.2	24.03	1.32	25.7	59	3E+06	0.9451	2.00E-04	3.01E-04	1.90E-04	1.61E-04	3.23E-04	0.0006	0.05	24.0	1.32	9	13.0	14.8	3.0E-04	1.4E+02	1.9E-04		
24.3	0.2	24.2	1.33	27.5	60	3E+06	0.9445	1.97E-04	2.00E-04	1.12E-04	9.55E-05	1.91E-04	0.0004	0.05	24.1	1.33	9	12.9	13.0	2.0E-04	1.4E+02	1.1E-04		
24.4	0.2	24.36	1.34	26.1	59	3E+06	0.944	2.00E-04	3.01E-04	1.85E-04	1.57E-04	3.14E-04	0.0006	0.05	24.3	1.34	9	13.0	14.8	3.0E-04	1.4E+02	1.8E-04		
24.6	0.2	24.52	1.35	25.3	59	3E+06	0.9434	2.03E-04	3.01E-04	1.95E-04	1.66E-04	3.31E-04	0.0007	0.05	24.4	1.35	9	13.1	14.8	3.0E-04	1.4E+02	1.9E-04		
24.8	0.2	24.69	1.36	26.1	59	3E+06	0.9429	2.01E-04	3.01E-04	1.85E-04	1.57E-04	3.14E-04	0.0006	0.05	24.6	1.36	9	13.0	14.8	3.0E-04	1.4E+02	1.8E-04		
24.9	0.2	24.85	1.37	28.3	61	3E+06	0.9423	1.97E-04	2.00E-04	1.07E-04	9.07E-05	1.81E-04	0.0004	0.05	24.8	1.37	9	12.9	13.0	2.0E-04	1.4E+02	1.1E-04		
25.1	0.2	25.02	1.38	27.9	61	3E+06	0.9417	1.98E-04	2.00E-04	1.09E-04	9.28E-05	1.86E-04	0.0004	0.05	24.9	1.38	9	13.0	13.0	2.0E-04	1.4E+02	1.1E-04		
25.3	0.2	25.18	1.38	27.2	60	3E+06	0.9411	2.00E-04	2.84E-04	1.62E-04	1.38E-04	2.76E-04	0.0005	0.05	25.1	1.38	9	13.0	14.5	2.8E-04	1.4E+02	1.6E-04		
25.4	0.2	25.34	1.39	26.5	60	3E+06	0.9405	2.03E-04	2.84E-04	1.70E-04	1.45E-04	2.89E-04	0.0006	0.04	25.3	1.39	9	13.1	14.5	2.8E-04	1.4E+02	1.7E-04		
25.6	0.2	25.51	1.40	27.3	60	3E+06	0.9399	2.01E-04	2.84E-04	1.62E-04	1.38E-04	2.75E-04	0.0005	0.04	25.4	1.40	9	13.0	14.5	2.8E-04	1.4E+02	1.6E-04		
25.8	0.2	25.67	1.41	27.4	60	3E+06	0.9393	2.02E-04	2.84E-04	1.61E-04	1.37E-04	2.73E-04	0.0005	0.04	25.6	1.41	9	13.0	14.5	2.8E-04	1.5E+02	1.6E-04		
25.9	0.2	25.84	1.42	27.4	60	3E+06	0.9387	2.02E-04	2.84E-04	1.61E-04	1.37E-04	2.73E-04	0.0005	0.04	25.8	1.42	9	13.1	14.5	2.8E-04	1.5E+02	1.6E-04		
26.1	0.2	26	1.43	27.8	61	3E+06	0.9381	2.01E-04	2.84E-04	1.56E-04	1.33E-04	2.66E-04	0.0005	0.04	25.9	1.43	9	13.0	14.5	2.8E-04	1.5E+02	1.6E-04		
26.2	0.2	26.16	1.44	27.1	60	3E+06	0.9375	2.04E-04	2.84E-04	1.63E-04	1.39E-04	2.78E-04	0.0005	0.04	26.1	1.44	9	13.1	14.5	2.8E-04	1.5E+02	1.6E-04		
26.4	0.2	26.33	1.45	27.2	60	3E+06	0.9368	2.04E-04	2.84E-04	1.63E-04	1.38E-04	2.77E-04	0.0005	0.04	26.2	1.45	9	13.1	14.5	2.8E-04	1.5E+02	1.6E-04		
26.6	0.2	26.49	1.46	28.0	61	3E+06	0.9362	2.03E-04	2.84E-04	1.55E-04	1.32E-04	2.63E-04	0.0005	0.04	26.4	1.46	9	13.1	14.5	2.8E-04	1.5E+02	1.5E-04		
26.7	0.2	26.66	1.47	26.8	60	3E+06	0.9355	2.06E-04	2.84E-04	1.67E-04	1.42E-04	2.84E-04	0.0006	0.04	26.6	1.47	9	13.1	14.5	2.8E-04	1.5E+02	1.7E-04		
26.9	0.2	26.82	1.48	25.8	59	3E+06	0.9349	2.09E-04	2.84E-04	1.78E-04	1.51E-04	3.02E-04	0.0006	0.04	26.7	1.48	9	13.2	14.5	2.8E-04	1.5E+02	1.8E-04		
27.1	0.2	26.98	1.48	25.4	59	3E+06	0.9342	2.11E-04	2.84E-04	1.83E-04	1.55E-04	3.11E-04	0.0006	0.04	26.9	1.48	9	13.2	14.5	2.8E-04	1.5E+02	1.8E-04		
27.2	0.2	27.15	1.49	24.6	58	3E+06	0.9335	2.13E-04	2.84E-04	1.93E-04	1.64E-04	3.28E-04	0.0006	0.04	27.1	1.49	9	13.3	14.5	2.8E-04	1.5E+02	1.9E-04		
27.4	0.2	27.31	1.50	24.5	58	3E+06	0.9329	2.14E-04	3.39E-04	2.32E-04	1.98E-04	3.95E-04	0.0008	0.04	27.2	1.50	9	13.3	15.3	3.4E-04	1.6E+02	2.3E-04		
27.6	0.2	27.48	1.51	24.5	58	3E+06	0.9322	2.15E-04	3.39E-04	2.34E-04	1.99E-04	3.97E-04	0.0008	0.04	27.4	1.51	9	13.3	15.3	3.4E-04	1.6E+02	2.3E-04		
27.7	0.2	27.64	1.52	23.9	58	3E+06	0.9315	2.17E-04	3.39E-04	2.43E-04	2.07E-04	4.14E-04	0.0008	0.04	27.6	1.52	9	13.4	15.3	3.4E-04	1.6E+02	2.4E-04		
27.9	0.2	27.81	1.53	24.1	58	3E+06	0.9308	2.17E-04	3.39E-04	2.40E-04	2.04E-04	4.09E-04	0.0008	0.04	27.7	1.53	9	13.4	15.3	3.4E-04	1.6E+02	2.4E-04		
28.1	0.2	27.97	1.54	24.2	58	3E+06	0.9301	2.17E-04	3.39E-04	2.38E-04	2.03E-04	4.05E-04	0.0008	0.03	27.9	1.54	9	13.4	15.3	3.4E-04	1.6E+02	2.4E-04		
28.2	0.2	28.13	1.55	24.9	58	3E+06	0.9293	2.15E-04	3.39E-04	2.26E-04	1.92E-04	3.84E-04	0.0008	0.03	28.1	1.55	9	13.3	15.3	3.4E-04	1.6E+02	2.3E-04		
28.4	0.2	28.3	1.56	23.2	57	3E+06	0.9286	2.21E-04	3.39E-04	2.56E-04	2.17E-04	4.35E-04	0.0009	0.03	28.2	1.56	9	13.4	15.3	3.4E-04	1.6E+02	2.6E-04		
28.5	0.2	28.46	1.57	21.5	56	3E+06	0.9279	2.27E-04	3.39E-04	2.93E-04	2.49E-04	4.98E-04	0.0010	0.03	28.4	1.57	9	13.6	15.3	3.4E-04	1.6E+02	2.9E-04		
28.7	0.2	28.63	1.57	18.5	53	3E+06	0.9271	2.39E-04	3.39E-04	3.79E-04	3.22E-04	6.45E-04	0.0013	0.03	28.5	1.57	9	13.8	15.3	3.4E-04	1.6E+02	3.8E-04		
28.9	0.2	28.79	1.58	19.7	54	3E+06	0.9264	2.35E-04	3.39E-04	3.40E-04	2.89E-04	5.79E-04	0.0011	0.03	28.7	1.58	9	13.7	15.3	3.4E-04	1.6E+02	3.4E-04		
29.0	0.2	28.95	1.59	21.2	55	3E+06	0.9256	2.30E-04	3.39E-04	3.00E-04	2.55E-04	5.10E-04	0.0010	0.03	28.9	1.59	9	13.6	15.3	3.4E-04	1.7E+02	3.0E-04		
29.2	0.2	29.12	1.60	23.5	57	3E+06	0.9248	2.22E-04	3.39E-04	2.50E-04	2.13E-04	4.25E-04	0.0008	0.03	29.0	1.60	9	13.5	15.3	3.4E-04	1.7E+02	2.5E-04		
29.4	0.2	29.28	1.61	23.8	57	3E+06	0.924	2.22E-04	3.39E-04	2.45E-04	2.08E-04	4.16E-04	0.0008	0.03	29.2	1.61	9	13.5	15.3	3.4E-04	1.7E+02	2.4E-04		
29.5	0.2	29.45	1.62	23.7	57	3E+06	0.9232	2.23E-04	3.39E-04	2.47E-04	2.10E-04	4.20E-04	0.0008	0.03	29.4	1.62	9	13.5	15.3	3.4E-04	1.7E+02	2.5E-04		
29.7	0.2	29.61	1.63	22.7	57	3E+06	0.9224	2.26E-04	3.39E-04	2.66E-04	2.26E-04	4.51E-04	0.0009	0.03	29.5	1.63	9	13.5	15.3	3.4E-04	1.7E+02	2.7E-04		
29.9	0.2	29.77	1.64	21.8	56	3E+06	0.9216	2.30E-04	3.39E-04	2.86E-04	2.43E-04	4.86E-04	0.0010	0.02	29.7	1.64	9	13.6	15.3	3.4E-04	1.7E+02	2.9E-04		
30.0	0.2	29.94	1.65	21.7	56	3E+06	0.9208	2.30E-04	3.39E-04	2.87E-04	2.44E-04	4.88E-04	0.0010	0.02	29.9	1.65	9	13.6	15.3	3.4E-04	1.7E+02	2.9E-04		
30.2	0.2	30.1	1.66	22.6	56	3E+06	0.92	2.28E-04	3.39E-04	2.69E-04	2.29E-04	4.58E-04	0.0009	0.02	30.0	1.66	9	13.6	15.3	3.4E-04	1.7E+02	2.7E-04		
30.3	0.2	30.27	1.66	23.4	57	3E+06	0.9191	2.26E-04	3.39E-04	2.53E-04	2.15E-04	4.30E-04	0.0008	0.02	30.2	1.66	10	13.5	15.3	3.4E-04	1.7E+02	2.5E-04		
30.5	0.2	30.43	1.67	24.2	58	3E+06	0.9183	2.24E-04	3.39E-04	2.38E-04	2.02E-04	4.05E-04	0.0008	0.02	30.3	1.67	10	13.5	15.3	3.4E-04	1.7E+02	2.4E-04		
30.7	0.2	30.59	1.68	24.1	58	3E+06	0.9174	2.24E-04	3.39E-04	2.39E-04	2.03E-04	4.07E-04	0.0008	0.02	30.5	1.68	10	13.5	15.3	3.4E-04	1.8E+02	2.4E-04		
30.8	0.2	30.76	1.69	24.1	58	3E+06	0.9165	2.25E-04	3.39E-04	2.40E-04	2.04E-04	4.09E-04	0.0008	0.02	30.7	1.69	10	13.5	15.3	3.4E-04	1.8E+02	2.4E-04		
31.0	0.2	30.92	1.70	24.0	58	3E+06	0.9157	2.25E-04	3.39E-04	2.41E-04	2.05E-04	4.10E-04	0.0008	0.02	30.8	1.70	10	13.5	15.3	3.4E-04	1.8E+02	2.4E-04		
31.2	0.2	31.09	1.71	24.8	58	3E+06	0.9148	2.23E-04	3.39E-04	2.28E-04	1.94E-04	3.87E-04	0.0008	0.02	31.0	1.71	10	13.5	15.3	3.4E-04	1.8E+02	2.3E-04		
31.3	0.2	31.25	1.72	25.6	59	3E+06	0.9139	2.21E-04	3.39E-04	2.16E-04	1.83E-04	3.67E-04	0.0007	0.02	31.2	1.72	10	13.4	15.3	3.4E-04	1.8E+02	2.2E-04		
31.5	0.2	31.41	1.73	25.6	59	3E+06	0.913	2.22E-04	3.39E-04	2.16E-04	1.84E-04	3.67E-04	0.0007	0.02	31.3	1.73	10	13.5	15.3	3.4E-04	1.8E+02	2.2E-04		
31.7	0.2	31.58	1.74	25.7	59	3E+06	0.912	2.22E-04	3.39E-04	2.14E-04	1.82E-04	3.65E-04	0.0007	0.02	31.5	1.74	10	13.5	15.3	3.4E-04	1.8E+02	2.1E-04		
31.8	0.2	31.74	1.75	26.2	59	4E+06	0.9111	2.21E-04	3.39E-04	2.07E-04	1.76E-04	3.52E-04	0.0007	0.01	31.7	1.75	10	13.4	15.3	3.4E-04	1.8E+02	2.1E-04		
32.0	0.2	31.91	1.75	28.4	61	4E+06	0.9102	2.15E-04	3.39E-04	1.81E-04	1.54E-04	3.07E-04	0.0006	0.01	31.8	1.75	10	13.3	15.3	3.4E-04	1.8E+02	1.8E-04		
32.2	0.2	32.07	1.76	32.0	63	4E+06	0.9092	2.07E-04	2.84E-04	1.24E-04	1.06E-04	2.11E-04	0.0004	0.01	32.0	1.76	10	13.2	14.5	2.8E-04	1.8E+02	1.2E-04		
32.3	0.2	32.23	1.77	37.0	67	4E+06	0.9083	1.98E-04	1.88E-04	6.77E-05	5.75E-05	1.15E-04	0.0002	0.01	32.2	1.77	10	13.0	12.8	1.9E-04	1.9E+02	6.8E-05		
32.5	0.2	32.4	1.78	39.0	68	4E+06	0.9073	1.94E-04	1.88E-04	6.38E-05	5.43E-05	1.09E-04	0.0002	0.01	32.3	1.78	10	12.9	12.8	1.9E-04	1.9E+02	6.4E-05		
32.6	0.2	32.56	1.79	42.5	70	4E+06	0.9063	1.89E-04	1.88E-04	5.95E-05	5.06E-05	1.01E-04	0.0002	0.01	32.5	1.79	10	12.8	12.8	1.9E-04	1.9E+02	6.0E-05		
32.8	0.2	32.73	1.80	49.4	73	4E+06	0.9053	1.80E-04	1.88E-04	5.80E-05	4.93E-05	9.85E-05	0.0002	0.01	32.6	1.80	10	12.6	12.8	1.9E-04	1.9E+02	5.8E-05		
33.0	0.2	32.89	1.81	55.4	76	5E+06	0.9043	1.74E-04	1.88E-04	6.41E-05	5.45E-05	1.09E-04	0.0002	0.01	32.8	1.81	10	12.4	12.8	1.9E-04	1.9E+02	6.4E-05		
33.1	0.2	33.05	1.82	59.6	78	5E+06	0.9033	1.70E-04	1.88E-04	7.36E-05	6.26E-05	1.25E-04	0.0003	0.01	33.0	1.82	10	12.3	12.8	1.9E-04	1.9E+02	7.4E-05		
33.3	0.2	33.22	1.83	62.0	79	5E+06	0.9023	1.68E-04	1.88E-04	8.19E-05	6.96E-05	1.39E-04	0.0003	0.01	33.1	1.83	10	12.2	12.8	1.9E-04	1.9E+02	8.2E-05		
33.5	0.2	33.38	1.84	63.5	80	5E+06	0.9012	1.67E-04	1.88E-04	8.80E-05	7.48E-05	1.50E-04	0.0003	0.01	33.3	1.84	10	12.2	12.8	1.9E-04	1.9E+02	8.8E-05		
33.6	0.2	33.55	1.85	63.7	80	5E+06	0.9002	1.67E-04	1.88E-04	8.91E-05	7.57E-05	1.51E-04	0.0003	0.01	33.5	1.85	10	12.2	12.8	1.9E-04	1.9E+02	8.9E-05		
33.8	0.2	33.71	1.85	64.3	80	5E+06	0.8991	1.66E-04	1.88E-04	9.19E-05	7.81E-05	1.56E-04	0.0003	0.01	33.6	1.85	10	12.2	12.8	1.9E-04	1.9E+02	9.2E-05		
34.0	0.2	33.87	1.86	63.5	80	5E+06	0.8981	1.67E-04	1.88E-04	8.79E-05	7.48E-05	1.50E-04	0.0003	0.01	33.8	1.86	10	12.2	12.8	1.9E-04	2.0E+02	8.8E-05		
34.1	0.2	34.04	1.87	62.4	79	5E+06	0.897	1.68E-04	1.88E-04	8.35E-05	7.10E-05	1.42E-04	0.0003	0.01	34.0	1.87	10	12.3	12.8	1.9E-04	2.0E+02	8.3E-05		
34.3	0.2	34.2	1.88	62.1	79	5E+06	0.8959	1.69E-04	1.88E-04	8.22E-05	6.99E-05	1.40E-04	0.0003	0.01	34.1	1.88	10	12.3	12.8	1.9E-04	2.0E+02	8.2E-05		
34.4	0.2	34.37	1.89	60.7	78	5E+06	0.8948	1.70E-04	1.88E-04	7.71E-05	6.55E-05	1.31E-04	0.0003	0.01	34.3	1.89	10	12.3	12.8	1.9E-04	2.0E+02	7.7E-05		
34.6	0.2	34.53	1.90	60.9	79	5E+06	0.8937	1.70E-04	1.88E-04	7.77E-05	6.60E-05	1.32E-04	0.0003	0.01	34.4	1.90	10	12.3	12.8	1.9E-04	2.0E+02	7.8E-05		
34.8	0.2	34.69	1.91	60.1	78	5E+06	0.8926	1.71E-04	1.88E-04	7.51E-05	6.38E-05	1.28E-04	0.0003	0.01	34.6	1.91	10	12.3	12.8	1.9E-04	2.0E+02	7.5E-05		
34.9	0.2	34.86	1.92	58.9	78	5E+06	0.8914	1.73E-04	1.88E-04	7.18E-05	6.10E-05	1.22E-04	0.0002	0.01	34.8	1.92	10	12.4	12.8	1.9E-04	2.0E+02	7.2E-05		
35.1	0.2	35.02	1.93	55.6	76	5E+06	0.8903	1.76E-04	1.88E-04	6.45E-05	5.48E-05	1.10E-04	0.0002	0.01	34.9	1.93	10	12.5	12.8	1.9E-04	2.0E+02	6.5E-05		
35.3	0.2	35.19	1.94	55.0	76	5E+06	0.8891	1.77E-04	1.88E-04	6.34E-05	5.39E-05	1.08E-04	0.0002	0.01	35.1	1.94	10	12.5	12.8	1.9E-04	2.0E+02	6.3E-05		
35.4	0.2	35.35	1.94	54.9	76	5E+06	0.888	1.77E-04	1.88E-04	6.33E-05	5.38E-05	1.08E-04	0.0002	0.01	35.3	1.94	10	12.5	12.8	1.9E-04	2.0E+02	6.3E-05		
35.6	0.2	35.51	1.95	54.5	76	5E+06	0.8868	1.78E-04	1.88E-04	6.27E-05	5.33E-05	1.07E-04	0.0002	0.01	35.4	1.95	10	12.5	12.8	1.9E-04	2.1E+02	6.3E-05		
35.8	0.2	35.68	1.96	55.2	76	5E+06	0.8856	1.77E-04	1.88E-04	6.37E-05	5.42E-05	1.08E-04	0.0002	0.01	35.6	1.96	10	12.5	12.8	1.9E-04	2.1E+02	6.4E-05		
35.9	0.2	35.84	1.97	54.0	75	5E+06	0.8844	1.79E-04	1.88E-04	6.20E-05	5.27E-05	1.05E-04	0.0002	0.01	35.8	1.97	10	12.5	12.8	1.9E-04	2.1E+02	6.2E-05		
36.1	0.2	36.01	1.98	54.3	76	5E+06	0.8832	1.79E-04	1.88E-04	6.25E-05	5.31E-05	1.06E-04	0.0002	0.01	35.9	1.98	10	12.5	12.8	1.9E-04	2.1E+02	6.2E-05		
36.3	0.2	36.17	1.99	52.1	75	5E+06	0.882	1.81E-04	1.88E-04	5.98E-05	5.08E-05	1.02E-04	0.0002	0.01	36.1	1.99	10	12.6	12.8	1.9E-04	2.1E+02	6.0E-05		
36.4	0.2	36.34	2.00	53.6	75	5E+06	0.8808	1.80E-04	1.88E-04	6.14E-05	5.22E-05	1.04E-04	0.0002	0.01	36.3	2.00	10	12.5	12.8	1.9E-04	2.1E+02	6.1E-05		
36.6	0.2	36.5	2.01	55.0	76	5E+06	0.8796	1.78E-04	1.78E-04	5.99E-05	5.10E-05	1.02E-04	0.0002	0.01	36.4	2.01	10	12.5	12.5	1.8E-04	2.1E+02	6.0E-05		
36.7	0.2	36.66	2.02	55.2	76	5E+06	0.8783	1.78E-04	1.78E-04	6.02E-05	5.12E-05	1.02E-04	0.0002	0.01	36.6	2.02	10	12.5	12.5	1.8E-04	2.1E+02	6.0E-05		
36.9	0.2	36.83	2.03	56.8	77	5E+06	0.8771	1.77E-04	1.78E-04	6.29E-05	5.35E-05	1.07E-04	0.0002	0.01	36.7	2.03	10	12.5	12.5	1.8E-04	2.1E+02	6.3E-05		
37.1	0.2	36.99	2.03	59.3	78	5E+06	0.8758	1.74E-04	1.78E-04	6.86E-05	5.83E-05	1.17E-04	0.0002	0.01	36.9	2.03	10	12.4	12.5	1.8E-04	2.1E+02	6.9E-05		
37.2	0.2	37.16	2.04	63.5	80	5E+06	0.8745	1.71E-04	1.78E-04	8.33E-05	7.08E-05	1.42E-04	0.0003	0.01	37.1	2.04	10	12.3	12.5	1.8E-04	2.2E+02	8.3E-05		
37.4	0.2	37.32	2.05	67.0	81	5E+06	0.8732	1.68E-04	1.78E-04	1.02E-04	8.65E-05	1.73E-04	0.0003	0.01	37.2	2.05	10	12.2	12.5	1.8E-04	2.2E+02	1.0E-04		
37.6	0.2	37.48	2.06	67.2	81	5E+06	0.8719	1.68E-04	1.78E-04	1.03E-04	8.75E-05	1.75E-04	0.0003	0.01	37.4	2.06	10	12.2	12.5	1.8E-04	2.2E+02	1.0E-04		
37.7	0.2	37.65	2.07	67.6	81	5E+06	0.8706	1.67E-04	1.78E-04	1.06E-04	8.98E-05	1.80E-04	0.0004	0.01	37.6	2.07	10	12.2	12.5	1.8E-04	2.2E+02	1.1E-04		
37.9	0.2	37.81	2.08	68.9	82	5E+06	0.8693	1.66E-04	1.78E-04	1.16E-04	9.82E-05	1.96E-04	0.0004	0.00	37.7	2.08	10	12.2	12.5	1.8E-04	2.2E+02	1.2E-04		
38.1	0.2	37.98	2.09	69.4	82	5E+06	0.868	1.66E-04	1.78E-04	1.20E-04	1.02E-04	2.04E-04	0.0004	0.00	37.9	2.09	10	12.2	12.5	1.8E-04	2.2E+02	1.2E-04		
38.2	0.2	38.14	2.10	67.5	81	5E+06	0.8666	1.68E-04	1.78E-04	1.05E-04	8.92E-05	1.78E-04	0.0004	0.00	38.1	2.10	10	12.2	12.5	1.8E-04	2.2E+02	1.0E-04		
38.4	0.2	38.3	2.11	66.2	81	5E+06	0.8653	1.69E-04	1.78E-04	9.71E-05	8.25E-05	1.65E-04	0.0003	0.00	38.2	2.11	10	12.3	12.5	1.8E-04	2.2E+02	9.7E-05		
38.5	0.2	38.47	2.12	65.9	81	5E+06	0.8639	1.69E-04	1.78E-04	9.54E-05	8.11E-05	1.62E-04	0.0003	0.00	38.4	2.12	10	12.3	12.5	1.8E-04	2.2E+02	9.5E-05		
38.7	0.2	38.63	2.12	66.0	81	5E+06	0.8626	1.69E-04	1.78E-04	9.59E-05	8.15E-05	1.63E-04	0.0003	0.00	38.5	2.12	10	12.3	12.5	1.8E-04	2.2E+02	9.6E-05		
38.9	0.2	38.8	2.13	64.6	80	5E+06	0.8612	1.71E-04	1.78E-04	8.85E-05	7.52E-05	1.50E-04	0.0003	0.00	38.7	2.13	10	12.3	12.5	1.8E-04	2.3E+02	8.8E-05		
39.0	0.2	38.96	2.14	64.8	80	5E+06	0.8598	1.71E-04	1.78E-04	8.91E-05	7.57E-05	1.51E-04	0.0003	0.00	38.9	2.14	10	12.3	12.5	1.8E-04	2.3E+02	8.9E-05		
39.2	0.2	39.12	2.15	63.8	80	5E+06	0.8584	1.72E-04	1.78E-04	8.44E-05	7.17E-05	1.43E-04	0.0003	0.00	39.0	2.15	10	12.3	12.5	1.8E-04	2.3E+02	8.4E-05		
39.4	0.2	39.29	2.16	66.6	81	5E+06	0.857	1.69E-04	1.78E-04	9.93E-05	8.44E-05	1.69E-04	0.0003	0.00	39.2	2.16	10	12.3	12.5	1.8E-04	2.3E+02	9.9E-05		
39.5	0.2	39.45	2.17	63.6	80	5E+06	0.8556	1.72E-04	1.78E-04	8.35E-05	7.10E-05	1.42E-04	0.0003	0.00	39.4	2.17	10	12.4	12.5	1.8E-04	2.3E+02	8.3E-05		
39.7	0.2	39.62	2.18	63.5	80	5E+06	0.8542	1.72E-04	1.78E-04	8.32E-05	7.07E-05	1.41E-04	0.0003	0.00	39.5	2.18	10	12.4	12.5	1.8E-04	2.3E+02	8.3E-05		
39.9	0.2	39.78	2.19	65.6	81	5E+06	0.8527	1.70E-04	1.78E-04	9.37E-05	7.96E-05	1.59E-04	0.0003	0.00	39.7	2.19	10	12.3	12.5	1.8E-04	2.3E+02	9.4E-05		
40.0	0.2	39.94	2.20	66.1	81	5E+06	0.8513	1.70E-04	1.78E-04	9.61E-05	8.17E-05	1.63E-04	0.0003	0.00	39.9	2.20	10	12.3	12.5	1.8E-04	2.3E+02	9.6E-05		
40.2	0.2	40.11	2.21	66.3	81	5E+06	0.8498	1.70E-04	1.78E-04	9.75E-05	8.29E-05	1.66E-04	0.0003	0.00	40.0	2.21	10	12.3	12.5	1.8E-04	2.3E+02	9.7E-05		
0.0	-40.2	20.1	1.11	0.0	0	0	0.9566	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.00	40.2	1.11	8	#####	#DIV/0!	#DIV/0!	2.3E+02	#DIV/0!		

col No	1	2	3	4	5	6	7	8	9	10	11	12
overburden	0.1 tsf		0.2 tsf		0.5 tsf		1 tsf		2 tsf		4 tsf	
	0.1	0.14	0.2	0.32	0.5	0.7	1	1.4	2	2.7	4	
-0.06	-0.07	-0.07	-0.07	-0.071	-0.07	-0.036	0.00	3E-15	0.00	3E-15	0.00	
2.97	3.17	3.173	3.17	3.21	3.25	3.21	3.17	3.2456	3.32	3.3188	3.32	
4.71	5.12	5.123	5.12	5.1581	5.19	5.1581	5.12	5.1581	5.19	5.1938	5.19	
6.01	6.85	6.78	6.71	6.7088	6.71	6.6	6.49	6.4913	6.49	6.4913	6.49	
6.94	8.15	8.004	7.86	7.8244	7.79	7.68	7.57	7.6088	7.65	7.6463	7.65	
7.74	9.23	9.053	8.87	8.835	8.80	8.6531	8.51	8.4731	8.44	8.4375	8.44	
9.00	11.25	10.88	10.50	10.3	10.10	10.05	10.00	10	10.00	10	10.00	
9.91	12.91	12.37	11.83	11.539	11.25	11.106	10.96	10.817	10.67	10.673	10.67	
11.50	17.00	15.9	14.80	14.143	13.49	13.243	13.00	12.75	12.50	12.5	12.50	
13.00	24.59	21.49	18.39	17.164	15.94	15.36	14.78	14.531	14.28	14.279	14.28	
13.30	29.86	24.43	19.00	17.75	16.50	16.05	15.60	15.3	15.00	14.996	14.99	
14.68		33	26.18	22.933	19.69	18.679	17.67	17.201	16.73	16.652	16.57	
15.00			29.78	25.457	21.13	19.869	18.61	17.804	17.00	16.878	16.76	
16.04				28	24.59	22.573	20.55	19.796	19.04	18.693	18.35	
16.97					29.86	26.683	23.51	22.284	21.06	20.363	19.67	
17.65						28	26.32	24.555	22.79	21.724	20.66	
18.39							30.00	27.512	25.02	23.427	21.83	
18.95								30	27.12	25.022	22.93	
19.57									29.93	27.173	24.42	
21											30	



N-SPT	A-intercept
5	32.5
10	36
15	38.5
20	40
30	42.5
40	45



a_{max} = 0.371

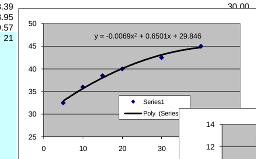
C.314.41.00 KAISER LAKE FOREST MOB

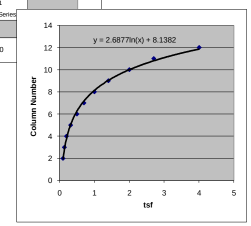
SEISMIC SETTLEMENT OF DRY SAND AT CPT06
USING EQUIVALENT SPT ANALYSIS (Tokimatsu and Seed, 1987)

Depth of layer base(ft)	Layer thickness (ft)	Average layer depth (ft)	avg layer stress (tsf)	(N1-60)cs	K2-max	G-max	r-d	gama-e*(G-e/G-m)	gamma-e-calculated	epsln-c (M=7.5)-calculated	epsln-c (M=6.8)	2*epsln-c (M=6.8)	settlement (in)	Cumulative settlement (inch)	Depth (ft) of top of layer	sig-v tsf	column Number	x	y	gamma-e-calculated	gamma-e-read from curve	epsilon-c-calculated	epsilon-c-read off curve
0.2	0.2	0.085	0.00	10.2	43	132526	1.0007	1.70E-05	9.84E-06	2.61E-05	2.22E-05	4.44E-05	0.0001	0.47	0.0	0.00	6	2.3	-0.1	9.8E-06	-1.1E+01	2.6E-05	
0.3	0.2	0.245	0.01	11.9	46	236846	1.0007	2.75E-05	2.08E-05	4.54E-05	3.86E-05	7.71E-05	0.0002	0.47	0.2	0.01	3	4.4	3.2	2.1E-05	-1.0E+01	4.5E-05	
0.5	0.2	0.41	0.02	11.9	46	306391	1.0006	3.55E-05	3.25E-05	7.11E-05	6.04E-05	1.21E-04	0.0002	0.47	0.3	0.02	2	5.5	5.1	3.3E-05	-9.0E+00	7.1E-05	
0.7	0.2	0.575	0.03	11.9	46	362842	1.0003	4.21E-05	3.99E-05	8.72E-05	7.41E-05	1.48E-04	0.0003	0.47	0.5	0.03	1	6.2	6.0	4.0E-05	-8.0E+00	8.7E-05	
0.8	0.2	0.74	0.04	13.7	48	431106	1.0001	4.55E-05	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0.47	0.7	0.04	0	6.6	######	#VALUE!	-7.0E+00	#VALUE!	
1.0	0.2	0.9	0.05	18.8	53	528206	0.9998	4.52E-05	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0.47	0.8	0.05	0	6.6	######	#VALUE!	-6.0E+00	#VALUE!	
1.2	0.2	1.065	0.06	26.0	59	640458	0.9994	4.41E-05	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0.47	1.0	0.06	1	6.4	######	#VALUE!	-5.0E+00	#VALUE!	
1.3	0.2	1.23	0.07	28.3	61	708552	0.9991	4.60E-05	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0.47	1.2	0.07	1	6.6	######	#VALUE!	-4.0E+00	#VALUE!	
1.5	0.2	1.395	0.08	32.3	64	788094	0.9987	4.69E-05	3.99E-05	1.72E-05	1.47E-05	2.93E-05	0.0001	0.28	1.3	0.08	1	6.7	6.0	4.0E-05	-3.0E+00	1.7E-05	
1.6	0.2	1.56	0.09	39.1	68	887769	0.9983	4.65E-05	3.99E-05	1.35E-05	1.15E-05	2.29E-05	0.0000	0.28	1.5	0.09	2	6.7	6.0	4.0E-05	-2.0E+00	1.3E-05	
1.8	0.2	1.72	0.09	39.6	68	936451	0.998	4.86E-05	3.99E-05	1.33E-05	1.13E-05	2.26E-05	0.0000	0.28	1.6	0.09	2	6.9	6.0	4.0E-05	-1.0E+00	1.3E-05	
2.0	0.5	1.72	0.09	38.3	67	925813	0.998	4.92E-05	3.99E-05	1.38E-05	1.17E-05	2.34E-05	0.0001	0.28	1.5	0.09	2	6.9	6.0	4.0E-05	4.0E-03	1.4E-05	
2.1	0.2	2.05	0.11	28.8	61	919708	0.9972	5.90E-05	6.53E-05	3.39E-05	2.88E-05	5.76E-05	0.0001	0.28	2.0	0.11	2	7.7	8.1	6.5E-05	1.0E+00	3.4E-05	
2.3	0.2	2.215	0.12	28.4	61	951794	0.9968	6.15E-05	8.38E-05	4.45E-05	3.78E-05	7.56E-05	0.0002	0.28	2.1	0.12	2	7.9	9.2	8.4E-05	2.0E+00	4.4E-05	
2.5	0.2	2.38	0.13	29.2	62	995801	0.9964	6.32E-05	8.38E-05	4.25E-05	3.61E-05	7.22E-05	0.0001	0.28	2.3	0.13	3	8.0	9.2	8.4E-05	3.0E+00	4.2E-05	
2.6	0.2	2.54	0.14	30.2	62	1E+06	0.9961	6.45E-05	8.38E-05	4.03E-05	3.42E-05	6.85E-05	0.0001	0.28	2.5	0.14	3	8.1	9.2	8.4E-05	4.0E+00	4.0E-05	
2.8	0.2	2.705	0.15	39.6	68	1E+06	0.9957	6.08E-05	8.04E-05	2.68E-05	2.28E-05	4.56E-05	0.0001	0.28	2.6	0.15	3	7.8	9.1	8.0E-05	5.0E+00	2.7E-05	
3.0	0.2	2.87	0.16	33.5	64	1E+06	0.9953	6.62E-05	8.04E-05	3.29E-05	2.80E-05	5.59E-05	0.0001	0.28	2.8	0.16	3	8.2	9.1	8.0E-05	6.0E+00	3.3E-05	
3.1	0.2	3.035	0.17	31.0	63	1E+06	0.9949	6.98E-05	8.04E-05	3.70E-05	3.15E-05	6.29E-05	0.0001	0.28	3.0	0.17	3	8.4	9.1	8.0E-05	7.0E+00	3.7E-05	
3.3	0.2	3.2	0.18	31.6	63	1E+06	0.9945	7.12E-05	8.04E-05	3.59E-05	3.05E-05	6.10E-05	0.0001	0.28	3.1	0.18	3	8.5	9.1	8.0E-05	8.0E+00	3.6E-05	
3.4	0.2	3.36	0.18	33.0	64	1E+06	0.9941	7.19E-05	8.04E-05	3.37E-05	2.86E-05	5.73E-05	0.0001	0.28	3.3	0.18	4	8.6	9.1	8.0E-05	9.0E+00	3.4E-05	
3.6	0.2	3.525	0.19	33.6	64	1E+06	0.9937	7.32E-05	8.04E-05	3.28E-05	2.79E-05	5.58E-05	0.0001	0.28	3.4	0.19	4	8.6	9.1	8.0E-05	1.0E+01	3.3E-05	
3.8	0.2	3.69	0.20	35.8	66	1E+06	0.9933	7.33E-05	8.04E-05	3.00E-05	2.55E-05	5.11E-05	0.0001	0.28	3.6	0.20	4	8.7	9.1	8.0E-05	1.1E+01	3.0E-05	
3.9	0.2	3.855	0.21	38.1	67	1E+06	0.9929	7.34E-05	8.04E-05	2.79E-05	2.37E-05	4.75E-05	0.0001	0.28	3.8	0.21	4	8.7	9.1	8.0E-05	1.2E+01	2.8E-05	
4.1	0.2	4.02	0.22	38.1	67	1E+06	0.9925	7.49E-05	7.71E-05	2.68E-05	2.28E-05	4.55E-05	0.0001	0.28	3.9	0.22	4	8.7	8.9	7.7E-05	1.3E+01	2.7E-05	
4.3	0.2	4.185	0.23	37.5	67	1E+06	0.9921	7.68E-05	7.71E-05	2.72E-05	2.32E-05	4.63E-05	0.0001	0.28	4.1	0.23	4	8.9	8.9	7.7E-05	1.4E+01	2.7E-05	
4.4	0.2	4.35	0.24	36.0	66	1E+06	0.9918	7.93E-05	7.71E-05	2.87E-05	2.44E-05	4.87E-05	0.0001	0.28	4.3	0.24	4	9.0	8.9	7.7E-05	1.5E+01	2.9E-05	
4.6	0.2	4.51	0.25	33.4	64	1E+06	0.9914	8.28E-05	1.12E-04	4.62E-05	3.93E-05	7.85E-05	0.0002	0.28	4.4	0.25	4	9.2	10.5	1.1E-04	1.6E+01	4.6E-05	
4.8	0.2	4.675	0.26	32.4	64	1E+06	0.991	8.51E-05	1.12E-04	4.83E-05	4.11E-05	8.21E-05	0.0002	0.28	4.6	0.26	4	9.3	10.5	1.1E-04	1.7E+01	4.8E-05	
4.9	0.2	4.84	0.27	29.8	62	1E+06	0.9906	8.90E-05	1.12E-04	5.52E-05	4.69E-05	9.39E-05	0.0002	0.28	4.8	0.27	5	9.5	10.5	1.1E-04	1.8E+01	5.5E-05	
5.1	0.2	5.005	0.28	30.6	63	1E+06	0.9902	8.96E-05	1.12E-04	5.27E-05	4.48E-05	8.95E-05	0.0002	0.28	4.9	0.28	5	9.5	10.5	1.1E-04	1.9E+01	5.3E-05	
5.3	0.2	5.17	0.28	32.1	63	2E+06	0.9898	8.97E-05	1.12E-04	4.89E-05	4.16E-05	8.32E-05	0.0002	0.28	5.1	0.28	5	9.5	10.5	1.1E-04	2.0E+01	4.9E-05	
5.4	0.2	5.33	0.29	32.4	64	2E+06	0.9895	9.08E-05	1.12E-04	4.84E-05	4.11E-05	8.22E-05	0.0002	0.28	5.3	0.29	5	9.6	10.5	1.1E-04	2.1E+01	4.8E-05	
5.6	0.2	5.495	0.30	32.0	63	2E+06	0.9891	9.25E-05	1.12E-04	4.93E-05	4.19E-05	8.38E-05	0.0002	0.28	5.4	0.30	5	9.7	10.5	1.1E-04	2.2E+01	4.9E-05	
5.7	0.2	5.66	0.31	32.8	64	2E+06	0.9887	9.30E-05	1.07E-04	4.53E-05	3.85E-05	7.69E-05	0.0001	0.27	5.6	0.31	5	9.7	10.3	1.1E-04	2.3E+01	4.5E-05	
5.9	0.2	5.825	0.32	31.6	63	2E+06	0.9883	9.56E-05	1.07E-04	4.80E-05	4.08E-05	8.16E-05	0.0002	0.27	5.7	0.32	5	9.8	10.3	1.1E-04	2.4E+01	4.8E-05	
6.1	0.2	5.99	0.33	32.5	64	2E+06	0.9879	9.59E-05	1.07E-04	4.58E-05	3.89E-05	7.78E-05	0.0001	0.27	5.9	0.33	5	9.8	10.3	1.1E-04	2.5E+01	4.6E-05	
6.2	0.2	6.15	0.34	34.7	65	2E+06	0.9876	9.50E-05	1.07E-04	4.17E-05	3.55E-05	7.09E-05	0.0001	0.27	6.1	0.34	5	9.8	10.3	1.1E-04	2.6E+01	4.2E-05	
6.4	0.2	6.315	0.35	35.1	65	2E+06	0.9872	9.59E-05	1.07E-04	4.11E-05	3.49E-05	6.98E-05	0.0001	0.27	6.2	0.35	5	9.8	10.3	1.1E-04	2.7E+01	4.1E-05	
6.6	0.2	6.48	0.36	37.3	67	2E+06	0.9868	9.52E-05	1.07E-04	3.81E-05	3.24E-05	6.48E-05	0.0001	0.27	6.4	0.36	5	9.8	10.3	1.1E-04	2.8E+01	3.8E-05	
6.7	0.2	6.645	0.37	39.1	68	2E+06	0.9865	9.48E-05	1.07E-04	3.62E-05	3.08E-05	6.15E-05	0.0001	0.27	6.6	0.37	5	9.8	10.3	1.1E-04	2.9E+01	3.6E-05	
6.9	0.2	6.81	0.37	39.8	68	2E+06	0.9861	9.54E-05	1.07E-04	3.56E-05	3.02E-05	6.05E-05	0.0001	0.27	6.7	0.37	5	9.8	10.3	1.1E-04	3.0E+01	3.6E-05	
7.1	0.2	6.97	0.38	41.6	69	2E+06	0.9857	9.51E-05	1.07E-04	3.43E-05	2.92E-05	5.83E-05	0.0001	0.27	6.9	0.38	6	9.8	10.3	1.1E-04	3.1E+01	3.4E-05	
7.2	0.2	7.135	0.39	40.9	69	2E+06	0.9854	9.67E-05	1.07E-04	3.48E-05	2.95E-05	5.91E-05	0.0001	0.27	7.1	0.39	6	9.9	10.3	1.1E-04	3.2E+01	3.5E-05	
7.4	0.2	7.3	0.40	38.1	67	2E+06	0.985	1.00E-04	1.43E-04	4.95E-05	4.21E-05	8.42E-05	0.0002	0.27	7.2	0.40	6	10.0	11.5	1.4E-04	3.3E+01	5.0E-05	
7.6	0.2	7.465	0.41	32.9	64	2E+06	0.9846	1.06E-04	1.43E-04	6.00E-05	5.10E-05	1.02E-04	0.0002	0.27	7.4	0.41	6	10.3	11.5	1.4E-04	3.4E+01	6.0E-05	
7.7	0.2	7.63	0.42	31.3	63	2E+06	0.9843	1.09E-04	1.43E-04	6.46E-05	5.49E-05	1.10E-04	0.0002	0.27	7.6	0.42	6	10.4	11.5	1.4E-04	3.5E+01	6.5E-05	
7.9	0.2	7.79	0.43	30.9	63	2E+06	0.9839	1.11E-04	1.43E-04	6.60E-05	5.61E-05	1.12E-04	0.0002	0.27	7.7	0.43	6	10.4	11.5	1.4E-04	3.6E+01	6.6E-05	
8.0	0.2	7.955	0.44	33.1	64	2E+06	0.9835	1.09E-04	1.43E-04	5.93E-05	5.04E-05	1.01E-04	0.0002	0.27	7.9	0.44	6	10.4	11.5	1.4E-04	3.7E+01	5.9E-05	
8.2	0.2	8.12	0.45	35.7	66	2E+06	0.9832	1.08E-04	1.43E-04	5.35E-05	4.55E-05	9.09E-05	0.0002	0.27	8.0	0.45	6	10.3	11.5	1.4E-04	3.8E+01	5.3E-05	
8.4	0.2	8.285	0.46	37.5	67	2E+06	0.9828	1.07E-04	1.33E-04	4.71E-05	4.00E-05	8.00E-05	0.0002	0.27	8.2	0.46	6	10.3	11.3	1.3E-04	3.9E+01	4.7E-05	
8.5	0.2	8.45	0.46	38.8	68	2E+06	0.9825	1.07E-04	1.33E-04	4.54E-05	3.86E-05	7.71E-05	0.0001	0.27	8.4	0.46	6	10.3	11.3	1.3E-04	4.0E+01	4.5E-05	
8.7	0.2	8.61	0.47	35.6	66	2E+06	0.9821	1.11E-04	1.33E-04	5.02E-05	4.27E-05	8.54E-05	0.0002	0.27	8.5	0.47	6	10.5	11.3	1.3E-04	4.1E+01	5.0E-05	
8.9	0.2	8.775	0.48	32.3	64	2E+06	0.9818	1.16E-04	1.33E-04	5.76E-05	4.90E-05	9.79E-05	0.0002	0.27	8.7	0.48	6	10.6	11.3	1.3E-04	4.2E+01	5.8E-05	
9.0	0.2	8.94	0.49	29.4	62	2E+06	0.9814	1.20E-04	1.33E-04	6.69E-05	5.68E-05	1.14E-04	0.0002	0.27	8.9	0.49	6	10.8	11.3	1.3E-04	4.3E+01	6.7E-05	
9.2	0.2	9.105	0.50	35.4	66	2E+06	0.981	1.14E-04	1.33E-04	5.06E-05	4.30E-05	8.60E-05	0.0002	0.27	9.0	0.50	6	10.6	11.3	1.3E-04	4.4E+01	5.1E-05	
9.4	0.2	9.27	0.51	32.5	64	2E+06	0.9807	1.18E-04	1.33E-04	5.70E-05	4.84E-05	9.69E-05	0.0002	0.27	9.2	0.51	6	10.7	11.3	1.3E-04	4.5E+01	5.7E-05	
9.5	0.2	9.43	0.52	40.9	69	2E+06	0.9803	1.11E-04	1.33E-04	4.33E-05	3.68E-05	7.36E-05	0.0001	0.27	9.4	0.52	6	10.4	11.3	1.3E-04	4.6E+01	4.3E-05	
9.7	0.2	9.595	0.53	44.5	71	2E+06	0.98	1.08E-04	1.33E-04	4.11E-05	3.50E-05	6.99E-05	0.0001	0.27	9.5	0.53	6	10.4	11.3	1.3E-04	4.7E+01	4.1E-05	
9.8	0.2	9.76	0.54	43.6	70	2E+06	0.9796	1.10E-04	1.33E-04	4.15E-05	3.53E-05	7.06E-05	0.0001	0.27	9.7	0.54	6	10.4	11.3	1.3E-04	4.8E+01	4.2E-05	
10.0	0.2	9.925	0.55	41.7	69	2E+06	0.9793	1.13E-04	1.33E-04	4.26E-05	3.62E-05	7.24E-05	0.0001	0.27	9.8	0.55	7	10.5	11.3	1.3E-04	4.9E+01	4.3E-05	
10.2	0.2	10.09	0.55	39.8	68	2E+06	0.9789	1.15E-04	1.33E-04	4.43E-05	3.77E-05	7.53E-05	0.0001	0.27	10.0	0.55	7	10.6	11.3	1.3E-04	5.0E+01	4.4E-05	
10.3	0.2	10.25	0.56	37.3	67	2E+06	0.9786	1.19E-04	1.33E-04	4.75E-05	4.03E-05	8.07E-05	0.0002	0.27	10.2	0.56	7	10.7	11.3	1.3E-04	5.1E+01	4.7E-05	
10.5	0.2	10.415	0.57	36.7	66	2E+06	0.9782	1.20E-04	1.33E-04	4.83E-05	4.10E-05	8.21E-05	0.0002	0.27	10.3	0.57	7	10.8	11.3	1.3E-04	5.2E+01	4.8E-05	
10.7	0.2	10.58	0.58	35.9	66	2E+06	0.9779	1.22E-04	1.33E-04	4.97E-05	4.22E-05	8.44E-05	0.0002	0.27	10.5	0.58	7	10.9	11.3	1.3E-04	5.3E+01	5.0E-05	
10.8	0.2	10.745	0.59	38.1	67	2E+06	0.9775	1.21E-04	1.33E-04	4.63E-05	3.94E-05	7.87E-05	0.0002	0.27	10.7	0.59	7	10.8	11.3	1.3E-04	5.4E+01	4.6E-05	
11.0	0.2	10.91	0.60	37.4	67	2E+06	0.9772	1.22E-04	1.33E-04	4.73E-05	4.02E-05	8.04E-05	0.0002	0.27	10.8	0.60	7	10.9	11.3	1.3E-04	5.5E+01	4.7E-05	
11.2	0.2	11.07	0.61	38.2	67	2E+06	0.9769	1.22E-04	1.33E-04	4.62E-05	3.93E-05	7.86E-05	0.0002	0.27	11.0	0.61	7	10.9	11.3	1.3E-04	5.6E+01	4.6E-05	
11.3	0.2	11.235	0.62	40.1	68	2E+06	0.9765	1.21E-04	1.33E-04	4.40E-05	3.74E-05	7.49E-05	0.0002	0.27	11.2	0.62	7	10.8	11.3	1.3E-04	5.7E+01	4.4E-05	
11.5	0.2	11.4	0.63	43.5	70	2E+06	0.9762	1.19E-04	1.33E-04	4.16E-05	3.53E-05	7.07E-05	0.0001	0.27	11.3	0.63	7	10.7	11.3	1.3E-04	5.8E+01	4.2E-05	
11.7	0.2	11.565	0.64	46.7	72	3E+06	0.9758	1.17E-04	1.33E-04	4.07E-05	3.46E-05	6.92E-05	0.0001	0.27	11.5	0.64	7	10.7	11.3	1.3E-04	5.9E+01	4.1E-05	
11.8	0.2	11.73	0.65	46.0	72	3E+06	0.9755	1.18E-04	1.33E-04	4.08E-05	3.47E-05	6.93E-05	0.0001	0.27	11.7	0.65	7	10.7	11.3	1.3E-04	6.0E+01	4.1E-05	
12.0	0.2	11.895	0.65	44.4	71	3E+06	0.9751	1.20E-04	1.33E-04	4.12E-05	3.50E-05	7.00E-05	0.0001	0.27	11.8	0.65	7	10.8	11.3	1.3E-04	6.1E+01	4.1E-05	
12.1	0.2	12.06	0.66	40.4	69	2E+06	0.9748	1.25E-04	1.29E-04	4.23E-05	3.60E-05	7.19E-05	0.0001	0.27	12.0	0.66	7	11.0	11.1	1.3E-04	6.2E+01	4.2E-05	
12.3	0.2	12.22	0.67	37.4	67	2E+06	0.9744	1.29E-04	1.29E-04	4.57E-05	3.89E-05	7.77E-05	0.0001	0.27	12.1	0.67	7	11.1	11.1	1.3E-04	6.3E+01	4.6E-05	
12.5	0.2	12.385	0.68	36.2	66	2E+06	0.9741	1.31E-04	1.29E-04	4.75E-05	4.04E-05	8.07E-05	0.0002	0.27	12.3	0.68	7	11.2	11.1	1.3E-04	6.4E+01	4.7E-05	
12.6	0.2	12.55	0.69	39.6	68	3E+06	0.9737	1.28E-04	1.29E-04	4.30E-05	3.66E-05	7.31E-05	0.0001	0.27	12.5	0.69	7	11.1	11.1	1.3E-04	6.5E+01	4.3E-05	
12.8	0.2	12.715	0.70	43.0	70	3E+06	0.9734	1.25E-04	1.29E-04	4.04E-05	3.44E-05	6.87E-05	0.0001	0.27	12.6	0.70	7	11.0	11.1	1.3E-04	6.6E+01	4.0E-05	
13.0	0.2	12.88	0.71	45.8	71	3E+06	0.973	1.24E-04	1.29E-04	3.95E-05	3.36E-05	6.71E-05	0.0001	0.27	12.8	0.71	7	10.9	11.1	1.3E-04	6.7E+01	3.9E-05	
13.1	0.2	13.04	0.72	44.6	71	3E+06	0.9727	1.25E-04	1.29E-04	3.98E-05	3.38E-05	6.76E-05	0.0001	0.27	13.0	0.72	7	11.0	11.1	1.3E-04	6.8E+01	4.0E-05	
13.3	0.2	13.205	0.73	41.4	69	3E+06	0.9724	1.29E-04	1.29E-04	4.14E-05	3.52E-05	7.04E-05	0.0001	0.27	13.1	0.73	7	11.1	11.1	1.3E-04	6.9E+01	4.1E-05	
13.5	0.2	13.37	0.74	36.3	66	3E+06	0.972	1.36E-04	1.29E-04	4.75E-05	4.03E-05	8.07E-05	0.0002	0.27	13.3	0.74	7	11.3	11.1	1.3E-04	7.0E+01	4.7E-05	
13.6	0.2	13.535	0.74	35.3	66	3E+06	0.9717	1.38E-04	1.29E-04	4.92E-05	4.18E-05	8.36E-05	0.0002	0.27	13.5	0.74	7	11.4	11.1	1.3E-04	7.1E+01	4.9E-05	
13.8	0.2	13.7	0.75	37.7	67	3E+06	0.9713	1.36E-04	1.29E-04	4.53E-05	3.85E-05	7.70E-05	0.0001	0.27	13.6	0.75	7	11.3	11.1	1.3E-04	7.2E+01	4.5E-05	
13.9	0.2	13.86	0.76	43.8	70	3E+06	0.971	1.30E-04	1.29E-04	4.00E-05	3.40E-05	6.81E-05	0.0001	0.27	13.8	0.76	7	11.1	11.1	1.3E-04	7.3E+01	4.0E-05	
14.1	0.2	14.025	0.77	51.5	74	3E+06	0.9706	1.24E-04	1.29E-04	4.06E-05	3.45E-05	6.90E-05	0.0001	0.27	13.9	0.77	7	10.9	11.1	1.3E-04	7.4E+01	4.1E-05	
14.3	0.2	14.19	0.78	58.5	78	3E+06	0.9703	1.19E-04	1.29E-04	4.84E-05	4.12E-05	8.23E-05	0.0002	0.27	14.1	0.78	7	10.8	11.1	1.3E-04	7.5E+01	4.8E-05	
14.4	0.2	14.355	0.79	61.8	79	3E+06	0.9699	1.18E-04	1.29E-04	5.54E-05	4.71E-05	9.42E-05	0.0002	0.27	14.3	0.79	8	10.7	11.1	1.3E-04	7.6E+01	5.5E-05	
14.6	0.2	14.52	0.80	63.5	80	3E+06	0.9696	1.17E-04	1.29E-04	6.03E-05	5.13E-05	1.03E-04	0.0002	0.27	14.4	0.80	8	10.7	11.1	1.3E-04	7.7E+01	6.0E-05	
14.8	0.2	14.68	0.81	65.3	80	3E+06	0.9692	1.17E-04	1.29E-04	6.64E-05	5.65E-05	1.13E-04	0.0002	0.27	14.6	0.81	8	10.7	11.1	1.3E-04	7.8E+01	6.6E-05	
14.9	0.2	14.845	0.82	66.0	81	3E+06	0.9689	1.17E-04	1.29E-04	6.95E-05	5.90E-05	1.18E-04	0.0002	0.27	14.8	0.82	8	10.7	11.1	1.3E-04	7.9E+01	6.9E-05	
15.1	0.2	15.01	0.83	69.3	82	3E+06	0.9685	1.16E-04	1.29E-04	8.61E-05	7.32E-05	1.46E-04	0.0003	0.27	14.9	0.83	8	10.6	11.1	1.3E-04	8.0E+01	8.6E-05	
15.3	0.2	15.175	0.83	73.2	84	3E+06	0.9682	1.14E-04	1.29E-04	1.16E-04	9.85E-05	1.97E-04	0.0004	0.27	15.1	0.83	8	10.6	11.1	1.3E-04	8.1E+01	1.2E-04	
15.4	0.2	15.34	0.84	83.4	87	4E+06	0.9678	1.10E-04	1.29E-04	3.18E-04	2.70E-04	5.40E-04	0.0010	0.27	15.3	0.84	8	10.4	11.1	1.3E-04	8.2E+01	3.2E-04	
15.6	0.2	15.5	0.85	96.3	92	4E+06	0.9675	1.05E-04	1.29E-04	1.84E-03	1.57E-03	3.14E-03	0.0060	0.26	15.4	0.85	8	10.2	11.1	1.3E-04	8.3E+01	1.8E-03	
15.8	0.2	15.665	0.86	108.0	95	4E+06	0.9671	1.02E-04	1.29E-04	1.42E-02	1.21E-02	2.42E-02	0.0493	0.26	15.6	0.86	8	10.1	11.1	1.3E-04	8.4E+01	1.4E-02	
15.9	0.2	15.83	0.87	107.4	95	4E+06	0.9667	1.02E-04	1.29E-04	1.27E-02	1.08E-02	2.15E-02	0.0413	0.21	15.8	0.87	8	10.1	11.1	1.3E-04	8.5E+01	1.3E-02	
16.1	0.2	15.995	0.88	104.5	94	4E+06	0.9664	1.04E-04	1.29E-04	7.35E-03	6.24E-03	1.25E-02	0.0255	0.17	15.9	0.88	8	10.2	11.1	1.3E-04	8.6E+01	7.3E-03	
16.2	0.2	16.16	0.89	104.1	94	4E+06	0.966	1.05E-04	1.29E-04	6.89E-03	5.86E-03	1.17E-02	0.0225	0.14	16.1	0.89	8	10.2	11.1	1.3E-04	8.7E+01	6.9E-03	
16.4	0.2	16.32	0.90	105.2	94	4E+06	0.9656	1.05E-04	1.29E-04	8.45E-03	7.18E-03	1.44E-02	0.0276	0.12	16.2	0.90	8	10.2	11.1	1.3E-04	8.8E+01	8.5E-03	
16.6	0.2	16.485	0.91	106.9	95	4E+06	0.9653	1.05E-04	1.29E-04	1.16E-02	9.82E-03	1.96E-02	0.0401	0.09	16.4	0.91	8	10.2	11.1	1.3E-04	8.9E+01	1.2E-02	
16.7	0.2	16.65	0.92	101.4	93	4E+06	0.9649	1.07E-04	1.29E-04	4.28E-03	3.64E-03	7.27E-03	0.0140	0.05	16.6	0.92	8	10.3	11.1	1.3E-04	9.0E+01	4.3E-03	
16.9	0.2	16.815	0.92	101.4	93	4E+06	0.9645	1.07E-04	1.29E-04	4.24E-03	3.61E-03	7.21E-03	0.0147	0.04	16.7	0.92	8	10.3	11.1	1.3E-04	9.1E+01	4.2E-03	
17.1	0.2	16.98	0.93	100.5	93	4E+06	0.9642	1.08E-04	1.29E-04	3.67E-03	3.12E-03	6.24E-03	0.0120	0.02	16.9	0.93	8	10.3	11.1	1.3E-04	9.2E+01	3.7E-03	
17.2	0.2	17.14	0.94	100.2	93	4E+06	0.9638	1.09E-04	1.29E-04	3.46E-03	2.94E-03	5.89E-03	0.0113	0.01	17.1	0.94	8	10.4	11.1	1.3E-04	9.3E+01	3.5E-03	
#REF!	#REF!													0.00									

seismic Settlement (inch)

col No	1	2	3	4	5	6	7	8	9	10	11	12
overburden		**0.1 tsf**		**0.2 tsf**		**0.5 tsf**		**1 tsf**		**2 tsf**		**4 tsf**
		0.1	0.14	0.2	0.32	0.5	0.7	1	1.4	2	2.7	4
	-0.06	-0.07	-0.071	-0.07	-0.071	-0.07	-0.036	0.00	3E-15	0.00	3E-15	0.00
	2.97	3.17	3.173	3.17	3.21	3.25	3.21	3.17	3.2456	3.32	3.3188	3.32
	4.71	5.12	5.123	5.12	5.1581	5.19	5.1581	5.12	5.1581	5.19	5.1938	5.19
	6.01	6.85	6.78	6.71	6.7088	6.71	6.6	6.49	6.4913	6.49	6.4913	6.49
	6.94	8.15	8.004	7.86	7.8244	7.79	7.68	7.57	7.6088	7.65	7.6463	7.65
	7.74	9.23	9.053	8.87	8.835	8.80	8.6531	8.51	8.4731	8.44	8.4375	8.44
	9.00	11.25	10.88	10.50	10.3	10.10	10.05	10.00	10	10.00	10	10.00
	9.91	12.91	12.37	11.83	11.539	11.25	11.106	10.96	10.817	10.67	10.673	10.67
	11.50	17.00	15.9	14.80	14.143	13.49	13.243	13.00	12.75	12.50	12.5	12.50
	13.00	24.59	21.49	18.39	17.164	15.94	15.36	14.78	14.531	14.28	14.279	14.28
	13.30	29.86	24.43	19.00	17.75	16.50	16.05	15.60	15.3	15.00	14.996	14.99
	14.68		33	26.18	22.933	19.69	18.679	17.67	17.201	16.73	16.652	16.57
	15.00			29.78	25.457	21.13	19.869	18.61	17.804	17.00	16.878	16.76
	16.04				28	24.59	22.573	20.55	19.796	19.04	18.693	18.35
	16.97					29.86	26.683	23.51	22.284	21.06	20.363	19.67
	17.65						28	26.32	24.555	22.79	21.724	20.66
	18.39							30.00	27.512	25.02	23.427	21.83
	18.95								30	27.12	25.022	22.93
	19.57									29.93	27.173	24.42
	21											30





N-SPT	A-intercept
5	32.5
10	36
15	38.5
20	40
30	42.5
40	45

HUSHMAND ASSOCIATES, INCORPORATED
Geotechnical, Earthquake and Environmental Engineers

May 11, 2011
GOB-11-003

Mr. John Chevallier, Project Manager
GEOBASE, INC.
23362 Peralta Drive, Unit 6
Laguna Hills, California 92653

RE: PERCOLATION TEST
KAISER PERMANENTE SITE
LAKE FOREST DRIVE
FOOTHILL RANCH, CALIFORNIA

Dear Mr. Chevallier,

Hushmand Associates, Inc. (HAI) is pleased to submit this percolation test and sieve analysis results for Kaiser Permanente project site located at Lake Forest Drive, Foothill Ranch, California. The report includes percolation rate recommendations for the proposed site.

Please refer to the text of the report for detailed recommendations. If there are any questions concerning the findings in the report, please contact HAI.

Very truly yours,

HUSHMAND ASSOCIATES, INC.

Ben Hushmand
for

Naresh Bellana, M.S.
Staff Engineer

Ben Hushmand

Ben Hushmand, Ph.D., P.E. 44777
President, Principal Engineer

250 Goddard Irvine, California 92618 (949) 777-1266 Fax (949) 777-1276
www.hushmand-associates.com

PERCOLATION TESTS AND ANALYSES
KAISER PERMANENTE HOSPITAL SITE
LAKE FOREST DRIVE,
FOOTHILL RANCH, CALIFORNIA

Hushmand Associates, Inc. (HAI) is pleased to submit this Percolation Test report to Geobase Inc. for conducting percolation tests at the proposed Kaiser Permanente Hospital site located at Lake Forest Drive, Foothill Ranch, Orange County, California. The evaluation of percolation rates was performed in accordance with the County of Orange Resources & Development Management Department (County) guidelines.

Drilling for the percolation testing was performed on May 5, 2011. The three percolation test locations (B-1, B-2 and B-3) are presented in Figure 1. Borings were drilled using truck-mounted hollow-stem auger (HSA) drill rig by JDK Drilling. The borings were approximately 7 inches in diameter to a depth of 7 feet below the existing ground surface.

The project site consisted of graded & compacted fill. Boring B-1 consisted of gray, moist Clayey Sand (SC) from the ground surface to 7 feet below ground surface (bgs). Boring B-2 consisted of gray, moist Clayey Sand (SC) from the ground surface to 7 feet bgs and Boring B-3 consisted of gray, moist Clayey Sand (SC) from the ground surface to 7 feet bgs. Groundwater was not encountered in any of the boreholes during drilling.

A perforated 6-inch OD PVC pipe was installed in each of the open holes and the gap between the perforated pipe and the boring wall was filled with gravel to prevent caving during saturation and testing. The hole was presoaked and let set over night. On the next day, the borehole was presoaked again, and after presoaking percolation rates were measured in general conformance with the County guidelines.

Appendix A provides the percolation test readings, calculation tables presented in accordance with the County requirements, and the laboratory sieve analysis test results. Based on the in-situ measurements, the minimum recorded percolation rate of 0.1 gallon per square foot per day (3.8×10^{-6} cm/s) may be used for design at Boring B-1 location. The minimum recorded percolation rate of 0.2 gallon per square foot per day (1.0×10^{-5} cm/s) may be used for design at Boring B-2 location. The minimum recorded percolation rate of 0.4 gallon per square foot per day (1.9×10^{-5} cm/s) may be used for design at Boring B-3 location.

In theory the percolation rate is correlated to the hydraulic conductivity of soil. However, the percolation test is performed in the field condition, which will be affected by parameters such as soil's horizontal and vertical permeability, soil suction, soil saturation, in situ porosity of a larger area of the soil. Therefore, variation of these parameters in short distances should be expected.

Correlations are also available to obtain permeability of fine grained soils using clay fraction (CF), plasticity index (PI), and void ratio (e). A figure is provided in appendix A showing these correlations.

Project No. GOB-11-003	**Kaiser Permanente Hospital** Foothill Ranch, California	**PERCOLATION TEST LOCATIONS**	Figure **1**
HAI *HUSHMAND ASSOCIATES INC.* *Geotechnical and Earthquake Engineers*			

APPENDIX A

PERCOLATION TEST

Project:	Geobase - Lake Forest	**Project #:**	GOB-11-003
Staff:	NB	**Drillers:**	JDK Drilling
Boring Dia. (in):	7.00	**Date Tested:**	May 6, 2011
		Method Used to Prevent Sidewall	
Hours Presaturated:	24.00	**Caving:**	Gravel Packed

Boring ID	Initial Water Depth (ft)	Measured Water Depth (ft)	Start Time (hr:min:sec)	End Time (hr:min:sec)	T, Time Interval (hr)	F, Drop During Time Interval (ft)	L, Average Wetted Depth (ft)	D, Boring Diameter (ft)	Q, Percolation Rate (gal/sf/day)	Corrected Q, Percolation Rate (gal/sf/day)	Corrected Q, Percolation Rate (in/hr)
B-1	0.00	0.42	11:27:00 AM	11:57:00 AM	0.5000	0.42	6.79	0.58	0.6	0.6	**0.04**
Total Depth (ft):	0.00	0.38	11:58:00 AM	12:28:00 PM	0.5000	0.38	6.81	0.58	0.6	0.5	**0.04**
7	0.00	0.38	12:29:00 PM	12:59:00 PM	0.5000	0.38	6.81	0.58	0.6	0.5	**0.04**
	0.00	0.35	1:00:00 PM	1:30:00 PM	0.5000	0.35	6.82	0.58	0.5	0.5	**0.03**
	0.00	0.33	1:31:00 PM	2:01:00 PM	0.5000	0.33	6.83	0.58	0.5	0.5	**0.03**
	0.00	0.29	2:02:00 PM	2:32:00 PM	0.5000	0.29	6.85	0.58	0.4	0.4	**0.03**
	0.00	0.31	2:33:00 PM	3:03:00 PM	0.5000	0.31	6.84	0.58	0.5	0.5	**0.03**
	0.00	0.29	3:04:00 PM	3:34:00 PM	0.5000	0.29	6.85	0.58	0.4	0.4	**0.03**
	0.00	0.33	3:35:00 PM	4:05:00 PM	0.5000	0.33	6.83	0.58	0.5	0.5	**0.03**
	0.00	0.21	4:06:00 PM	4:36:00 PM	0.5000	0.21	6.90	0.58	0.3	0.3	**0.02**
	0.21	0.35	4:36:00 PM	5:06:00 PM	0.5000	0.15	6.72	0.58	0.2	0.2	**0.01**
	0.35	0.30	5:06:00 PM	5:36:00 PM	0.5000	0.05	6.67	0.58	0.1	0.1	**0.01**

PERCOLATION TEST

Project:	Geobase - Lake Forest	**Project #:**	GOB-11-003
Staff:	NB	**Drillers:**	JDK Drilling
Boring Dia. (in):	7.00	**Date Tested:**	May 6, 2011
		Method Used to Prevent Sidewall	
Hours Presaturated:	24.00	**Caving:**	Gravel Packed

Boring ID	Initial Water Depth (ft)	Measured Water Depth (ft)	Start Time (hr:min:sec)	End Time (hr:min:sec)	T, Time Interval (hr)	F, Drop During Time Interval (ft)	L, Average Wetted Depth (ft)	D, Boring Diameter (ft)	Q, Percolation Rate (gal/sf/day)	Corrected Q, Percolation Rate (gal/sf/day)	Corrected Q, Percolation Rate (in/hr)
B-2	0.00	0.29	11:33:00 AM	12:03:00 PM	0.5000	0.29	6.85	0.58	0.4	0.4	**0.03**
Total Depth (ft):	0.00	0.27	12:04:00 PM	12:34:00 PM	0.5000	0.27	6.86	0.58	0.4	0.4	**0.03**
7	0.00	0.25	12:35:00 PM	1:05:00 PM	0.5000	0.25	6.88	0.58	0.4	0.4	**0.02**
	0.00	0.25	1:06:00 PM	1:36:00 PM	0.5000	0.25	6.88	0.58	0.4	0.4	**0.02**
	0.00	0.25	1:37:00 PM	2:07:00 PM	0.5000	0.25	6.88	0.58	0.4	0.4	**0.02**
	0.00	0.25	2:08:00 PM	2:38:00 PM	0.5000	0.25	6.88	0.58	0.4	0.4	**0.02**
	0.00	0.23	2:39:00 PM	3:09:00 PM	0.5000	0.23	6.89	0.58	0.3	0.3	**0.02**
	0.00	0.21	3:10:00 PM	3:40:00 PM	0.5000	0.21	6.90	0.58	0.3	0.3	**0.02**
	0.00	0.21	3:41:00 PM	4:11:00 PM	0.5000	0.21	6.90	0.58	0.3	0.3	**0.02**
	0.00	0.23	4:12:00 PM	4:42:00 PM	0.5000	0.23	6.89	0.58	0.3	0.3	**0.02**
	0.23	0.38	4:42:00 PM	5:12:00 PM	0.5000	0.15	6.70	0.58	0.2	0.2	**0.01**
	0.38	0.52	5:12:00 PM	5:42:00 PM	0.5000	0.15	6.55	0.58	0.2	0.2	**0.01**

PERCOLATION TEST

Project:	Geobase - Lake Forest	**Project #:**	GOB-11-003
Staff:	NB	**Drillers:**	JDK Drilling
Boring Dia. (in):	7.00	**Date Tested:**	May 6, 2011
		Method Used to Prevent Sidewall	
Hours Presaturated:	24.00	**Caving:**	Gravel Packed

Boring ID	Initial Water Depth (ft)	Measured Water Depth (ft)	Start Time (hr:min:sec)	End Time (hr:min:sec)	T, Time Interval (hr)	F, Drop During Time Interval (ft)	L, Average Wetted Depth (ft)	D, Boring Diameter (ft)	Q, Percolation Rate (gal/sf/day)	Corrected Q, Percolation Rate (gal/sf/day)	Corrected Q, Percolation Rate (in/hr)
B-3	0.00	0.54	11:37:00 AM	12:07:00 PM	0.5000	0.54	6.73	0.58	0.8	0.8	**0.05**
Total Depth (ft):	0.00	0.31	12:08:00 PM	12:38:00 PM	0.5000	0.31	6.84	0.58	0.5	0.5	**0.03**
7	0.00	0.54	12:39:00 PM	1:09:00 PM	0.5000	0.54	6.73	0.58	0.8	0.8	**0.05**
	0.00	0.48	1:10:00 PM	1:40:00 PM	0.5000	0.48	6.76	0.58	0.7	0.7	**0.05**
	0.00	0.48	1:41:00 PM	2:11:00 PM	0.5000	0.48	6.76	0.58	0.7	0.7	**0.05**
	0.00	0.48	2:12:00 PM	2:42:00 PM	0.5000	0.48	6.76	0.58	0.7	0.7	**0.05**
	0.00	0.44	2:43:00 PM	3:13:00 PM	0.5000	0.44	6.78	0.58	0.7	0.6	**0.04**
	0.00	0.44	3:14:00 PM	3:44:00 PM	0.5000	0.44	6.78	0.58	0.7	0.6	**0.04**
	0.00	0.44	3:45:00 PM	4:15:00 PM	0.5000	0.44	6.78	0.58	0.7	0.6	**0.04**
	0.00	0.44	4:16:00 PM	4:46:00 PM	0.5000	0.44	6.78	0.58	0.7	0.6	**0.04**
	0.44	0.73	4:46:00 PM	5:16:00 PM	0.5000	0.29	6.42	0.58	0.5	0.5	**0.03**
	0.73	0.98	5:16:00 PM	5:46:00 PM	0.5000	0.25	6.15	0.58	0.4	0.4	**0.03**

HUSHMAND ASSOCIATES, INC.
Geotechnical and Earthquake Engineers

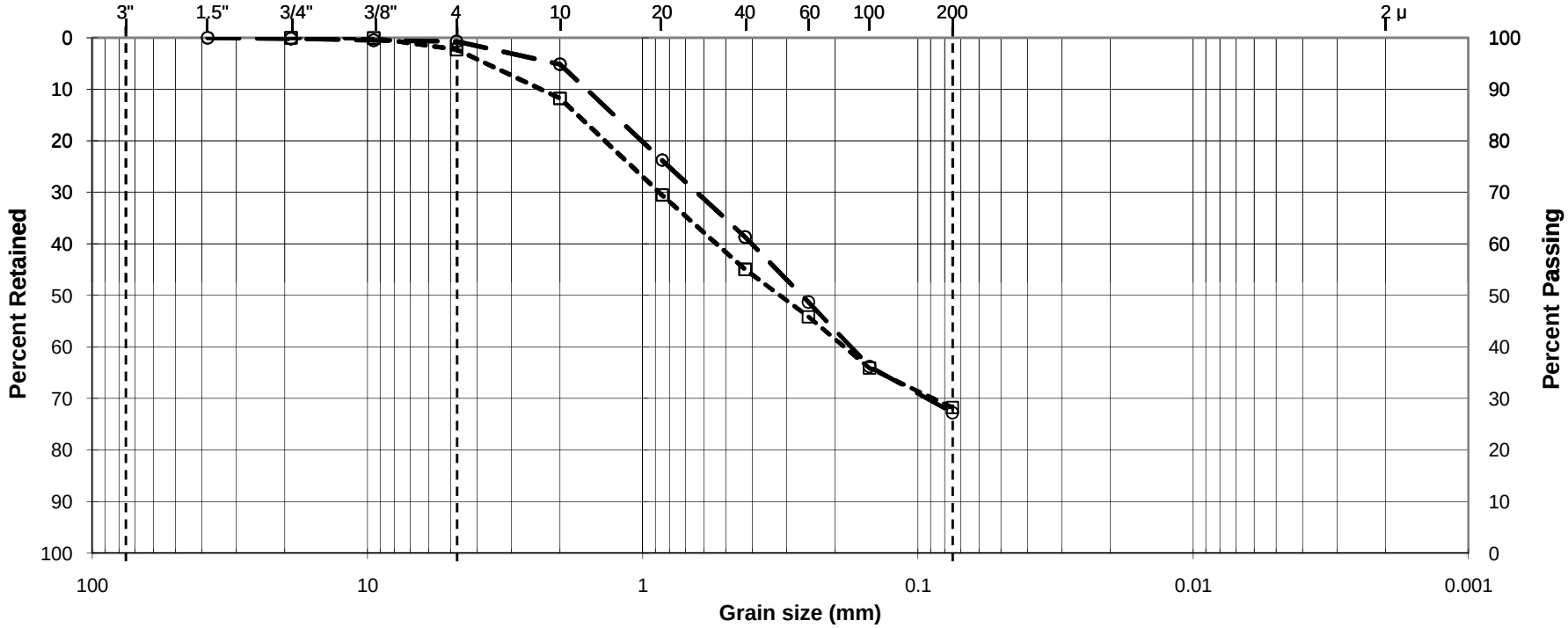
PARTICLE-SIZE ANALYSIS OF SOILS
(ASTM D422)

Client: Geobase
Project Name: Lake Forest
Project No.: --

HAI Project No.: GOB-11-003
Tested by: KL/PM
Checked by: NB
Date: 5/10/2011

COBBLES	GRAVEL		SAND			SILT AND CLAY
	Coarse	Fine	Coarse	Medium	Fine	

U.S. STANDARD SIEVE SIZES



Boring No.	Sample No.	Depth (ft)	Symbol	USCS	% Gravel	% Sand	% Fines
B 1	Bulk	---	○	Gray, Clayey Sand (SC)	0.7	72.0	27.2
B 3		---	□	Gray, Clayey Sand (SC)	2.3	69.4	28.2

Manual on Estimating Soil Properties for Foundation Design

EL-6800
Research Project 1493-6

Final Report, August 1990

Prepared by

CORNELL UNIVERSITY
Geotechnical Engineering Group
Hollister Hall
Ithaca, New York 14853-3501

Authors
F. H. Kulhawy
P. W. Mayne

Principal Investigator
F. H. Kulhawy

Prepared for

Electric Power Research Institute
3412 Hillview Avenue
Palo Alto, California 94304

EPRI Project Manager
V. J. Longo

Overhead Transmission Lines Program
Electrical Systems Division

Section 7

PERMEABILITY

The coefficient of permeability (k) of soil, also known as the hydraulic conductivity, describes the rate of water flow through soil. This soil property often is difficult to evaluate with certainty, because it varies over many orders of magnitude and in-situ soil conditions are highly variable. In addition to controlling the amount and rate of ground water inflow into foundation excavations, the coefficient of permeability also governs the rate of primary consolidation and equalization of pore water stresses.

TYPICAL VALUES

The value of the coefficient of permeability can vary over a wide range, as shown in Table 7-1. From this table, it is clear that k is highly dependent upon soil particle size. To obtain a first-order estimate of k in sands, Figure 7-1 suggests

Table 7-1

COEFFICIENT OF PERMEABILITY

Soil	Coefficient of Permeability, k (m/sec)	Relative Permeability
gravel	$> 10^{-3}$	high
sandy gravel, clean sand, fine sand	10^{-3} to 10^{-5}	medium
sand, dirty sand, silty sand	10^{-5} to 10^{-7}	low
silt, silty clay	10^{-7} to 10^{-9}	very low
clay	$< 10^{-9}$	practically impermeable

Source: Based on Terzaghi and Peck (1).

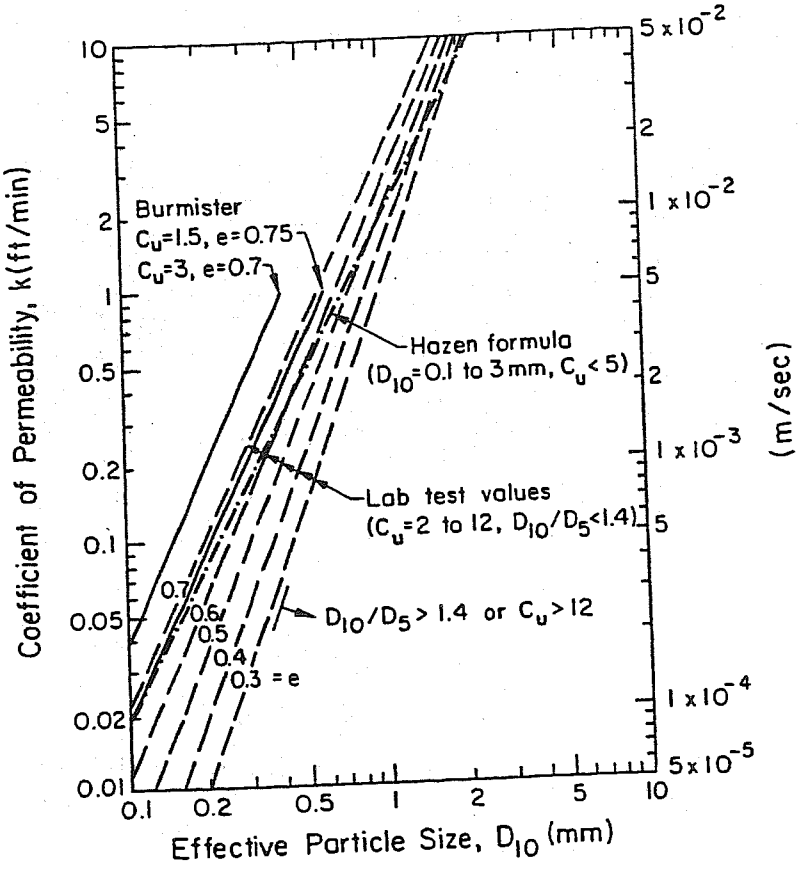


Figure 7-1. Coefficient of Permeability versus Particle Size

Source: NAVFAC (2), p. 7.1-139.

an approach in terms of void ratio (e) and effective particle size (expressed as D_{10}). The effect of particle size distribution and relative density on k is shown for several sands in Figure 7-2. The notation used is given in Table 2-7.

The in-situ vertical permeability (k_v) of clay may be estimated from the void ratio, plasticity index (PI), and clay fraction (CF), as shown in Figure 7-3. In geotechnical problems, drainage can occur horizontally as well as vertically. The ratio of horizontal to vertical permeability (k_h/k_v) generally is less than 1.5 for marine clays and other massive deposits. However, in varved clays and stratified fluvial deposits, k_h/k_v easily can exceed 10, as shown in Figure 7-4. Values of k_h/k_v over 100 are possible.

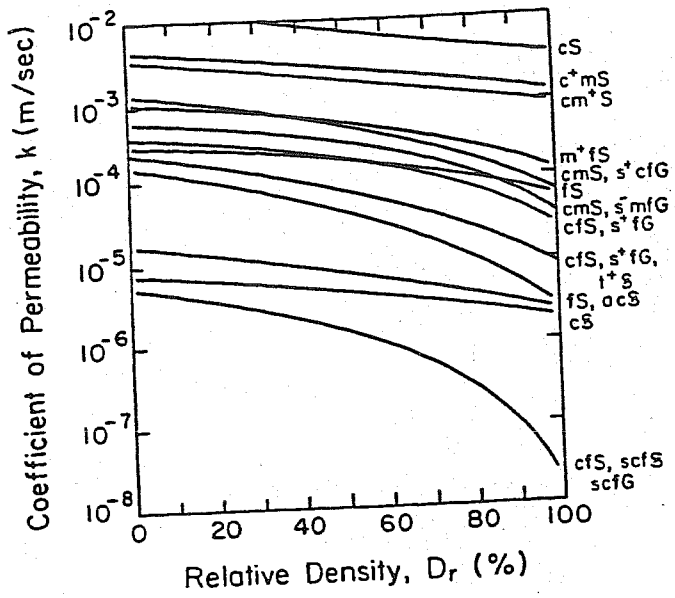


Figure 7-2. Coefficient of Permeability versus Particle Size and Relative Density

Source: Burmister (3), p. 78.

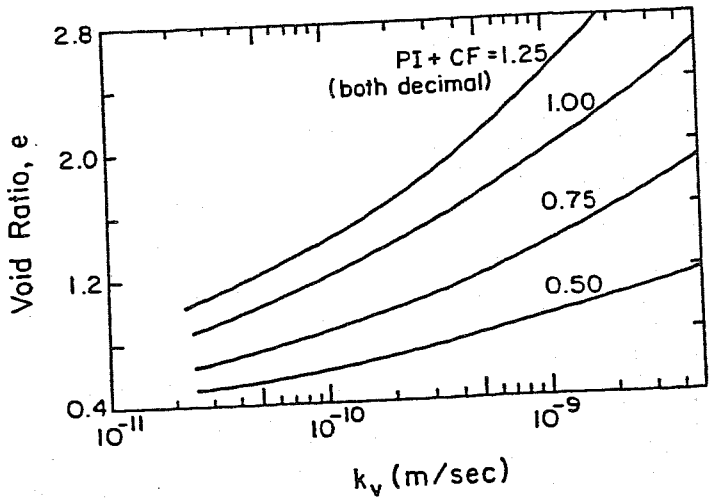


Figure 7-3. Vertical Coefficient of Permeability for Clay

Source: Tavenas, et al. (4), p. 658.